NUCLEAR SCIENCE ABSTRACTS

Vol. 7, No. 19, October 15, 1953

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CALENDAR OF MEETINGS

Suggestions for additions to this list will be welcomed and should be sent with all pertinent information to the Cataloging Branch, Technical Information Service, U. S. Atomic Energy Commission, P. O. Box 62, Oak Ridge, Tennessee.

October 18-22, 1953

SOCIETY FOR NONDESTRUCTIVE TESTING, INC., Cleveland, Ohio

October 29-30, 1953

CONFERENCE ON ATOMIC ENERGY, Waldorf-Astoria Hotel, New York, Sponsored by: National Industrial Conference Board.

Inquiries should be addressed to: R. Maxil Ballinger, Division of Business Practices, National Industrial Conference Board, 247 Park Avenue, New York 17, N. Y.

March 15-19, 1954

ELEVATED TEMPERATURE CORROSION SYMPOSIUM, Municipal Auditorium, Kansas City, Mo. Sponsored by: National Association of Corrosion Engineers – 10th Annual Conference

Person to Contact: Glenn A. Fitzlen
Ass't. Technical Director
Haynes Stellite Co.
Kokomo, Ind.

June 20-25, 1954

NUCLEAR ENERGY CONFERENCE, University of Michigan, Ann Arbor, Michigan, Sponsored by: American Institute of Chemical Engineers.

Inquiries should be addressed to: Professor Donald Katz, University of Michigan, Department of Engineers, Ann Arbor, Michigan.

ERRATA

NSA, Vol. 7, No. 9. In Numerical Index of Reports, for AECU-2196, journal reference should be Ann. Rev. Nuclear Sci. 2, 187-220(1953).

NSA, Vol. 7, No. 12B. In Numerical Index of Reports, for AECU-2196, journal reference should be Ann. Rev. Nuclear Sci. 2, 187-220(1953).

NSA, Vol. 6, No. 24A. In the Reports Reference List, p. 1074 the abstract for ISC-272 should read 6-6549.

NSA, Vol. 9, No. 15. In Numerical Index of Reports, for AECU-2424 delete availability information, J. Biol. Chem. 200, 7-16(1953).

NSA, Vol. 7, No. 3. In abstracts 766 and 768, p. 93 the journal reference should be J. Endocrinol.

REPORTS REFERENCE LIST

Vol. 7, No. 19

The abstract number for each report is listed at the upper right of the entry. If the number bears an asterisk, the report is title listed only and no abstract is included.

USAEC DECLASSIFIED REPORTS

AECD-3531 5320
Hanford Works
AN INTRODUCTION TO THE ANALYTICAL CHEMISTRY OF PLUTONIUM. G. B. Barton. May 21, 1953. Decl. June 9, 1953. 26p. (AECD-3531; HW-28136)

USAEC UNCLASSIFIED REPORTS

AECU-2601 5282
Atomic Energy Medical Research Project, Western Reserve Univ.
AN EVALUATION OF THE CLINICAL USE OF A Sr^{90} BETA RAY APPLICATOR WITH A REVIEW OF THE UNDERLYING PRINCIPLES. Hymer L. Friedell, C. I. Thomas, and J. S. Krohmer. Issued June 22, 1953. 40p. (AECU-2601)

AECU-2602 5266
Sloan-Kettering Inst. for Cancer Research
SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. Feb. 1, 1953. 99p. (AECU-2602)

AECU-2602(pt. 1) 5267
Sloan-Kettering Inst. for Cancer Research
PHYSICS AND BIOPHYSICS. pt. 1 of SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. Feb. 1, 1953. 59p. (AECU-2602(pt.1))

AECU-2602(pts. 2 and 3) 5268
Sloan-Kettering Inst. for Cancer Research
PROTEIN CHEMISTRY AND CLINICAL INVESTIGATION. pts. 2 and 3 of SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. Feb. 1, 1953. 25p. (AECU-2602(pts. 2 and 3))

AECU-2602(pts. 4 and 5) 5269
Sloan-Kettering Inst. for Cancer Research
IMMUNOCHEMISTRY AND RADIOCHEMISTRY. pts. 4 and 5 of SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. Feb. 1, 1953. 8p. (AECU-2602(pts. 4 and 5))

AECU-2606 5291
Oregon State Coll.
ISOTOPIC EXCHANGE REACTIONS IN LIQUID SULFUR DIOXIDE. 3. THE CATALYZED SULFUR EXCHANGE BETWEEN THIONYL BROMIDE AND SULFUR DIOXIDE. Rolfe H. Herber, T. H. Norris, and J. L. Huston. [1952] 24p. (AECU-2606)

AECU-2607 5434
Research Foundation, Ohio State Univ.
DESCRIPTION OF THE MODIFICATIONS OF THE OHIO STATE UNIVERSITY CYCLOTRON. FINAL REPORT, PART 1. H. J. Hausman. May 28, 1953. 9p. (AECU-2607)

AECU-2608 5289
Western Reserve Univ. School of Medicine
THE METABOLISM OF RIBONUCLEIC ACID IN NORMAL AND BACTERIOPHAGE-INFECTED ESCHERICHIA COLI. Lionel A. Manson. [1953] 28p. (AECU-2608)

AECU-2609 5287
Northwestern Univ. Medical School
INTRAPROSTATIC INJECTION OF RADIOACTIVE COLLOIDS. 1. DISTRIBUTION AND EXCRETION FOLLOWING INJECTION IN THE DOG. John A. D. Cooper, George J. Bulkley, and Vincent J. O'Conor. [nd] 7p. (AECU-2609)

AECU-2610 5288
Pittsburgh Univ. School of Medicine
IMMUNOCHEMICAL CROSS REACTIONS OF ALBUMINS AND GAMMA GLOBULINS. Paul H. Maurer. [1953] 8p. (AECU-2610)

AECU-2613 5314
Wisconsin Univ.
EFFECT OF DENSITY IN THE REGION OF THE CRITICAL TEMPERATURE ON THE CHEMICAL PRODUCTS OF THE $Br^{79}(n,\gamma)Br^{80}$ REACTION ON BROMOTRIFLUOROMETHANE. W. E. Rice and J. E. Willard. [1952] 12p. (AECU-2613)

AECU-2614 5260
Cancer Research Inst., New England Deaconess Hospital, Boston
THE PRODUCTION OF L(+) LACTIC ACID BY EHRLICH'S MOUSE ASCITES TUMOR CELLS. Myron Brin. [1953] 9p. (AECU-2614)

AECU-2615 5270
Research Foundation, Okla. Agricultural and Mechanical Coll.
[METHODS FOR THE NEUTRALIZATION OR ATTENUATION OF THE EFFECTS OF RADIATION UPON SEEDLINGS]; FINAL REPORT. R. M. Chatters. June 10, 1953. 7p. (AECU-2615)

AECU-2617 5261
Worcester Foundation for Experimental Biology
METABOLISM OF DEHYDROEPIANDROSTERONE AND Δ^5-ANDROSTENE-$3\beta,17\beta$-DIOL. Frank Ungar, A. M. Miller, and Ralph I. Dorfman. Worcester Foundation for Experimental Biology, and Western Reserve Univ. School of Medicine, and Lakeside Hospital, Western Reserve Univ. [1951] 22p. (AECU-2617)

AECU-2621 5262
Institute for the Study of Rate Processes, Univ. of Utah
KINETICS OF THE HILL REACTION OF ISOLATED CHLOROPLASTS IN FLASHING LIGHT; STUDIES OF PHOTOSYNTHETIC PROCESSES. Hugh S.A. Gilmour, Rufus Lumry, John D. Spikes, and Henry Eyring. July 1, 1953. 105p. (AECU-2621; Technical Report 11)

AECU-2625 5323
Los Alamos Scientific Lab.
THE INFRARED SPECTRA AND STRUCTURE OF LiOH, $LiOH \cdot H_2O$ AND THE DEUTERIUM SPECIES. REMARK ON FUNDAMENTAL FREQUENCY OF OH . Llewellyn H. Jones. [nd] 13p. (AECU-2625; LADC-1476)

ANL-5056 5399
Argonne National Lab.
THE PREPARATION OF GAS FOR ASSAY OF TRITIUM IN ORGANIC COMPOUNDS. K. E. Wilzbach, Louis Kaplan, and W. G. Brown. June 1953. 10p. (ANL-5056)

ANL-5068 5395
Argonne National Lab.
INSTRUMENT RESEARCH AND DEVELOPMENT DIVISION QUARTERLY PROGRESS REPORT FOR MARCH, APRIL, AND MAY 1953. June 1953. 19p. (ANL-5068)

ANL-5085 5375
Argonne National Lab.
THE HEAT CAPACITY OF THORIUM DIOXIDE FROM 10 TO 305°K. THE HEAT CAPACITY ANOMALIES IN URANIUM DIOXIDE AND NEPTUNIUM DIOXIDE. Darrell W. Osborne and Edgar F. Westrum, Jr. July 1953. 12p. (ANL-5085)

BNL-206 5263
Brookhaven National Lab.
THE MAJOR METABOLIC FUELS: BROOKHAVEN SYMPOSIA IN BIOLOGY NO. 5. Sept. 1952. 241p. (BNL-206)

BNL-227 5435
Brookhaven National Lab.
SHIELDING OF A HIGH CURRENT CYCLOTRON AND A VAN de GRAAFF MACHINE. M. Clark. Nov. 5, 1952. 23p. (BNL-227)

BNL-1479 5317
Brookhaven National Lab.
X-RAY MEASUREMENTS OF RADIATION DAMAGE IN BLACK PHOSPHORUS. D. L. Chipman and B. E. Warren, Massachusetts Inst. of Tech. and G. J. Dienes, Brookhaven National Lab. [1953] 4p. (BNL-1479)

CF-53-7-170 5436
Oak Ridge National Lab.
REACTOR LEAKAGE FOR SHIELDING CALCULATIONS. E. P. Blizard. July 24, 1953. 8p. (CF-53-7-170)

COO-187 5341
Armour Research Foundation
PHASE DIAGRAMS OF ZIRCONIUM-BASE BINARY ALLOYS; REPORT 11. THE ZIRCONIUM-NITROGEN SYSTEM; REPORT 1. APRIL 1, 1953–JUNE 30, 1953. R. F. Domagala and D. J. McPherson. June 30, 1953. 9p. (COO-187)

DP-28 5292
DuPont de Nemours, E. I., and Co. Explosives Dept., Atomic Energy Div.
THE FORMATION AND DISSOLUTION OF METAL SULFIDES. Herbert A. Pohl. June 4, 1953. 8p. (DP-28)

DPSPU-53-8 5312
DuPont De Nemours, E. I., and Co. Explosives Dept., Atomic Energy Div.
A PHOTO-AUTOMATIC TITRIMETER. 'D. N. Sunderman and R. C. Propst. June 12, 1953. 12p. (DPSPU-53-8)

ISC-235 5294
Ames Lab.
ACTIVITY COEFFICIENTS OF AQUEOUS METHANOL SOLUTIONS. William S. Brown and Don S. Martin. [June 1951] 27p. (ISC-235)

ISC-250 5295
Ames Lab.
MAGNETIC STUDIES OF NICKEL COMPLEXES WITH SOME vic-DIOXIMES. Roy William Vander Haar and Charles V. Banks. [June 1952] 80p. (ISC-250)

ISC-291 5427
Ames Lab.
ANGULAR DISTRIBUTION OF PHOTOPROTONS FROM ALUMINUM AND TANTALUM. Marvin M. Hoffman and D. J. Zaffarano. Aug. 1952. 62p. (ISC-291)

ISC-305 5342
Ames Lab.
TEMPERATURE DEPENDENCE OF ELECTRICAL RESISTIVITY OF METALS. Lazarus Weiner, Premo Chiotti, and H. A. Wilhelm. Dec. 1952. 83p. (ISC-305)

ISC-309 5322
Ames Lab.
ADSORPTION OF ALIPHATIC ALCOHOLS AND ACIDS FROM BINARY AQUEOUS SOLUTION BY NON-POROUS CARBONS. Roy P. Craig and Robert S. Hansen. Mar. 1953. 104p. (ISC-309)

ISC-342 5321
Ames Lab.
STRUCTURE OF THE RARE EARTH METALS AT LOW TEMPERATURES. J. R. Banister, S. Legvold, and F. H. Spedding. Mar. 1953. 44p. (ISC-342)

ISC-356 5343
Ames Lab.
CORRELATION OF VICKERS HARDNESS NUMBER, MODULUS OF ELASTICITY AND THE YIELD STRENGTH FOR DUCTILE METALS. Emil Arbtin, Jr. and Glenn Murphy. June 1953. 30p. (ISC-356)

ISC-359 5400
Ames Lab.
A MULTICHANNEL PULSE HEIGHT ANALYSIS SYSTEM UTILIZING A 35 MM. FILM RECORD. Warren A. Hunt, Wayne Rhinehart, John Weber, and D. J. Zaffarano. June 22, 1953. 23p. (ISC-359)

ISC-365 5376
Ames Lab.
THE THERMODYNAMIC FUNCTIONS OF POTASSIUM VAPOR. Maurice Griffel. [July 17, 1953] 3p. (ISC-365)

ISC-384 5344
Ames Lab.
ELECTRODEPOSITION OF METALS OF SODIUM TUNGSTEN BRONZE CRYSTALS. Dante Stirpe. [July 20, 1953] 2p. (ISC-384)

KAPL-667(rev.) 5303
Knolls Atomic Power Lab.
A METHOD FOR THE DETECTION OF ENRICHED URANIUM IN HUMAN URINE. R. Z. Bouton. July 21, 1953. 12p. (KAPL-667(rev.))

KAPL-853 5345
Knolls Atomic Power Lab.
A STUDY OF THE EFFECTS OF CYCLIC THERMAL STRESSES ON A DUCTILE METAL. L. F. Coffin, Jr. June 3, 1953. 129p. (KAPL-853)

KAPL-918 5401
Knolls Atomic Power Lab.
GENERALIZED OFF-AXIS EFFECTS FROM DISK SOURCES OF RADIATION. J. H. Smith and M. L. Storm. June 1, 1953. 43p. (KAPL-918)

KLI-1852 5346*
Carbide and Carbon Chemicals Co. (K-25)
METALLOGRAPHIC STUDY ELECTROLESS NICKEL

PLATE ON VARIOUS MATERIALS. W. W. Latham. Dec. 11, 1952. 9p. (KLI-1852)

MITG-A-109 5304
Mineral Engineering Lab., Mass. Inst. of Tech.
A CRITICAL STUDY OF THE SPECTROPHOTOMETRIC DETERMINATION OF ALUMINUM WITH FERRON (7-IODO-8-HYDROXYQUINOLINE-5-SULFONIC ACID). Julia M. Grandfield. Feb. 28, 1951. 28p. (MITG-A-109)

MIT-SVA-23 5347*
Metallurgical Project, Mass. Inst. of Tech.
PROPERTIES OF BERYLLIUM EXTRUDED AT 330°C AND ANNEALED AT HIGHER TEMPERATURES. S. V. Arnold. June 6, 1949. 6p. (MIT-SVA-23)

MTA-19 5328
Livermore Research Lab., Calif. Research and Development Co.
SURVEY OF METHODS FOR THE DETERMINATION OF THE SUBSONIC FLOW CHARACTERISTICS OF HEATED GASES. J. E. Mahlmeister and M. F. Katzer. Sept. 16, 1952. 33p. (MTA-19)

NYO-1587 5333
Air Cleaning Lab., Harvard Univ. School of Public Health
PERFORMANCE CHARACTERISTICS OF WET COLLECTORS. Melvin W. First, Glenn A. Johnson, Richard Dennis, Sheldon Friedlander, and Leslie Silverman. Mar. 11, 1953. 76p. (NYO-1587)

NYO-3430 5380
Princeton Univ.
ELECTRON MICROSCOPIC STUDY OF THE THERMAL DECOMPOSITION OF IRON PENTACARBONYL. Paul H. Till, Jr. and John Turkevich. Apr. 1, 1953. 20p. (NYO-3430)

NYO-3547 5298
Rutgers Univ.
SOME OBSERVATIONS ON THE HETEROPOLY ACIDS CONTAINING VANADIUM. E. R. Allen and J. L. Silver. July 16, 1953. 21p. (NYO-3547)

NYO-3826 5448
Rochester Univ.
ON THE INVARIANT FORMS OF THE NUCLEON-NUCLEON INTERACTION. David Feldman. July 27, 1953. 10p. (NYO-3826)

NYO-3829 5449
Rochester Univ.
THE CONSTRUCTION OF POTENTIALS IN QUANTUM FIELD THEORY. Abraham Klein. July 13, 1953. 5p. (NYO-3829)

NYO-3903 5428
Johns Hopkins Univ.
TRITON INDUCED ACTIVITIES IN Mg AND Al. Eric Iwersen, W. S. Koski, and Franco Rasetti. June 11, 1953. 12p. (NYO-3903)

NYO-4010 5326
Johns Hopkins Univ.
CONTAMINATION OF PLUMBING BY LOW-LEVEL RADIOISOTOPE WASTES: [FINAL REPORT]. Albert P. Talboys. May 1, 1952. 31p. (NYO-4010; JHUX-7)

NYO-4020 5271
Atomic Energy Project, Western Reserve Univ.
THE MECHANISM OF POTENTIATED LETHAL ACTION OF CERTAIN RADIOISOTOPES IN RATS AND MICE. Hymer L. Friedell, Paul R. Salerno, and Saul A. Rosenberg. Issued July 23, 1953. 22p. (NYO-4020)

RME-3051 5340
[Division of Raw Materials, AEC]
URANIUM-FLUORITE ASSOCIATION IN THE TODILTO LIMESTONE, GRANTS, NEW MEXICO. Paul F. Kerr and Harry Dahl. [nd] 6p. (RME-3051)

SEP-132 5361
Sylvania Electric Products, Inc., Atomic Energy Div.
SOLID STATE BONDING OF ALUMINUM AND NICKEL. S. Storchheim, J. L. Zambrow, and H. H. Hausner. Issued July 8, 1953. 45p. (SEP-132)

SO-1010 5301
Illinois Univ. Engineering Experiment Station
PARTICLE SIZE DISTRIBUTION IN HYGROSCOPIC AEROSOLS. G. R. Gillespie. May 1, 1953. 58p. (SO-1010; Technical Report 9)

SO-2510 5362
General Electric Research Lab.
THE TENSILE CHARACTERISTICS OF UNALLOYED ZIRCONIUM AT LOW AND MODERATE TEMPERATURES. J. H. Keeler. May 1953. 46p. (SO-2510; RL-892)

UCLA-263 5330
Atomic Energy Project, Univ. of Calif., Los Angeles
SOME PHENOMENA ASSOCIATED WITH SUPERSONIC LIQUID JETS. Brian Dunne and Benedict Cassen. July 24, 1953. 14p. (UCLA-263)

UCLA-265 5272
Atomic Energy Project, Univ. of Calif., Los Angeles
REPEATED INTRAVENOUS INFUSIONS OF OXYPOLYGELATIN (OPG) SOLUTION IN IRRADIATED RABBITS. Lawrence E. Detrick, Virginia Debley, and Thomas J. Haley. Issued July 30, 1953. 14p. (UCLA-265)

UCRL-2033(rev.) 5396
Radiation Lab., Univ. of Calif., Berkeley
INSTRUCTION MANUAL FOR DC PORTABLE VAPOR DETECTOR MODEL 3EPS. C. S. Presenz. June 1, 1953. 22p. (UCRL-2033(rev.))

UCRL-2240 5439
Radiation Lab., Univ. of Calif., Berkeley
ANGULAR DISTRIBUTIONS AND TOTAL CROSS SECTIONS FOR THE INELASTIC SCATTERING OF 31-MEV PROTONS FROM HEAVY ELEMENTS (thesis). Robert Martin Eisberg. June 15, 1953. 50p. (UCRL-2240)

UR-244 5264
Atomic Energy Project, Univ. of Rochester
ENZYME SYSTEMS OF THE CELL-SURFACE INVOLVED IN THE UPTAKE OF SUGARS BY YEAST. A. Rothstein. March 24, 1953. 58p. (UR-244)

UR-261 5278
Atomic Energy Project, Univ. of Rochester
STUDIES ON FLASH BURNS: THE PROTECTION AFFORDED BY 2, 4 AND 6 LAYER FABRIC COMBINATIONS. George Mixter, Jr., and Herman E. Pearse. June 4, 1953. 19p. (UR-261)

UR-262 5285
Atomic Energy Project, Univ. of Rochester
TOXICOLOGY OF THE MINOR METALS. Aser Rothstein. June 5, 1953. 35p. (UR-262)

OTHER UNCLASSIFIED REPORTS OF SPECIAL INTEREST TO AEC LABORATORIES

AERE-C/R-1170 5302
Atomic Energy Research Establishment, Harwell, Berks (England)
THE ANALYSIS OF SILVER-ZIRCONIUM ALLOYS. G. W. C. Milner and J. L. Woodhead. May 6, 1953. 14p. (AERE-C/R-1170)

AERE-C/R-1180 5426
Atomic Energy Research Establishment, Harwell, Berks (England)
THE FISSION YIELDS OF Ru^{103} AND Ru^{106}. W. H. Hardwick. Approved May 15, 1953. 16p. (AERE-C/R-1180)

AERE-CE/R-1089 5332
Atomic Energy Research Establishment, Harwell, Berks (England)
A. C. LIQUID METAL PUMPS FOR LABORATORY USE. D. A. Watt. Mar. 19, 1953. 27p. (AERE-CE/R-1089)

AERE-E/R-1205 5327
Atomic Energy Research Establishment, Harwell, Berks (England)
HEAT TRANSFER FROM A STAINLESS STEEL TUBE TO A SURROUNDING WATER COOLED COPPER TUBE UNDER VARYING AIR PRESSURES AND TEMPERATURES. W. E. Simmons. June 9, 1953. 18p. (AERE-E/R-1205)

AERE-I/R-1210 5398
Atomic Energy Research Establishment, Harwell, Berks (England)
4 Pi GEIGER COUNTERS AND COUNTING TECHNIQUES. D. B. Smith. June 18, 1953. 16p. (AERE-I/R-1210)

AERE-N/R-1163 5424
Atomic Energy Research Establishment, Harwell, Berks (England)
FISSION BALANCE TESTS IN GLEEP. F. C. W. Colmer, E. R. Wiblin, and W. B. Woollen. Mar. 1953. 36p. (AERE-N/R-1163)

APEX-134 5425
General Electric Co., ANP Project
FISSION PRODUCT DECAY GAMMA ENERGY SPECTRUM. John Moteff. [nd] 79p. (APEX-134)

DC-53-3-144 5437
General Electric Co., ANP Project
LINEAR AND QUADRATIC BUILDUP APPROXIMATIONS TO GAMMA ENERGY ABSORPTION. S. H. Minnich. Mar. 9, 1953. 21p. (DC-53-3-144)

DC-53-7-88 5438
General Electric Co., ANP Project
ATTENUATION OF FISSION PRODUCT GAMMA RAYS THROUGH WATER. John Moteff and Alice Barnett. July 17, 1953. 17p. (DC-53-7-88)

NACA-RM-L53E04a 5331
Langley Aeronautical Lab., NACA
PRELIMINARY INVESTIGATIONS OF STRENGTH CHARACTERISTICS OF STRUCTURAL ELEMENTS AT ELEVATED TEMPERATURES. Eldon E. Mathauser and Charles Libove. June 10, 1953. 12p. (NACA-RM-L53E04a)

NACA-TN-2970 5293
Purdue Univ.
PHYSICAL PROPERTIES OF CONCENTRATED NITRIC ACID. W.L. Sibbitt, C. R. St. Clair, T. R. Bump, P. F. Pagerey, J. P. Kern, and D. W. Fyfe. June 1953. 19p. (NACA-TN-2970)

NACA-TN-2975 5348
Langley Aeronautical Lab., NACA
STRUCTURAL EFFICIENCIES OF VARIOUS ALUMINUM, TITANIUM, AND STEEL ALLOYS AT ELEVATED TEMPERATURES. George J. Heimerl and Philip J. Hughes. July 1953. 16p. (NACA-TN-2975)

NACA-TN-2976 5329
Langley Aeronautical Lab., NACA
A STUDY OF THE STABILITY OF THE INCOMPRESSIBLE LAMINAR BOUNDARY LAYER ON INFINITE WEDGES. Neal Tetervin. Aug. 1953. 41p. (NACA-TN-2976)

NBS-2302 5377
National Bureau of Standards
HEAT CAPACITY OF FOUR ALLOYS: NICHROME V AND STAINLESS STEELS TYPES 347 AND 446, 0° TO 900°C; MONEL, 0° TO 300°C. Thomas B. Douglas and James L. Dever. Feb. 20, 1953. 26p. (NBS-2302)

NBS-2303 5296
National Bureau of Standards
HEAT CAPACITY OF THE EUTECTIC MIXTURE OF LITHIUM CHLORIDE AND POTASSIUM CHLORIDE FROM THE EUTECTIC TEMPERATURE TO 800°C. Thomas B. Douglas and James L. Dever. Feb. 20, 1953. 14p. (NBS-2303)

NBS-2544 5349
National Bureau of Standards
THE HEAT CAPACITY OF LEAD FROM 0° TO 900°C, AND THE HEAT OF FUSION; THE HEAT CAPACITY OF THE LEAD-BISMUTH EUTECTIC ALLOY FROM 150° TO 800°C. Thomas B. Douglas and James L. Dever. Apr. 18, 1953. 26p. (NBS-2544)

NP-4675 5350
Engineering Research Inst., Univ. of Mich.
TOOL LIFE VERSUS NOSE RADIUS WHEN TURNING TITANIUM. L. V. Colwell. Jan. 1953. (NP-4675; Report 7)

NP-4676 5351
Brush Development Co.
DEVELOPMENT OF TITANIUM ALLOY POWDER PRODUCTION; INTERIM TECHNICAL REPORT [FOR] AUGUST 15, 1951 TO FEBRUARY 28, 1953. Harry W. Dodds. 24p. (NP-4676)

NP-4679 5352
Engineering Research Inst., Univ. of Mich.
THE CUTTING CHARACTERISTICS OF TITANIUM; PRELIMINARY REPORT. L. V. Colwell and W. C. Truckenmiller. Dec. 1952. 30p. (NP-4679; Report 1)

NP-4680 5353
Engineering Research Inst., Univ. of Mich.
MECHANICAL PROPERTIES OF MACHINABILITY PROGRAM WORK MATERIALS. L. V. Colwell and W. C. Truckenmiller. Dec. 1952. 39p. (NP-4680; Report 2)

NP-4681 5354
Engineering Research Inst., Univ. of Mich.
EFFECT OF SIDE RAKE ANGLE ON TOOL LIFE IN TURNING TITANIUM (HIGH-SPEED-STEEL TOOLS). L. V. Colwell. Jan. 1953. 62p. (NP-4681; Report 3)

NP-4682 5355
Engineering Research Inst., Univ. of Mich.
EFFECT OF SIZE OF CUT ON TOOL LIFE IN TURNING TITANIUM. L. V. Colwell. Jan. 1953. 56p. (NP-4682; Report 4)

NP-4683 5356
Engineering Research Inst., Univ. of Mich.
CUTTING SPEED VERSUS TOOL LIFE WHEN SHAPING TITANIUM WITH HIGH-SPEED-STEEL TOOLS. L. V. Colwell and R. E. McKee. Jan. 1953. 22p. (NP-4683; Report 5)

NP-4684 5357
Engineering Research Inst., Univ. of Mich.
POWER HACKSAW OPERATIONS ON TITANIUM AND ITS ALLOYS. Frank Sowa and L. V. Colwell. Jan. 1953. 33p. (NP-4684; Report 6)

NP-4685 5358
Purdue Univ.
METALLURGICAL STUDIES IN THE SUB-MICROSCOPIC RANGE (thesis). John Frederick Radavich. May 1953. 85p. (NP-4685)

NP-4686 5411
Research Lab. of Electronics, Mass. Inst. of Tech.
MICROWAVE SPECTRUM OF THE WATER MOLECULE. Desmond Walter Posener. May 14, 1953. 164p. (NP-4686; Technical Report 255)

NP-4687 5381
Applied Physics Lab., Univ. of Wash.
A SEARCH FOR ANOMALOUS ABSORPTION OF HIGH ENERGY NEGATIVE PARTICLES. W. R. Davis, G. R. Garrison, J. E. Henderson, C. E. Miller, and W. M. Sandstrom. [1953] 72p. (NP-4687)

NP-4688 5382
Applied Physics Lab., Univ. of Wash.
THE MOMENTUM SPECTRUM OF COSMIC RAYS AT 3.4 KILOMETERS. J. E. Henderson, C. E. Miller, D. S. Potter, J. Todd, and A. W. Wotring. [nd] 94p. (NP-4688)

NP-4689 5383
Applied Physics Lab., Univ. of Wash.
ANALYSIS OF THE HARD COMPONENT OF THE COSMIC RADIATION INTO ITS PROTONIC AND MESONIC COMPONENTS AT 3.4 KILOMETERS AND AT SEA LEVEL. J. E. Henderson, C. E. Miller, D. S. Potter, and J. Todd, Jr. [1953] 103p. (NP-4689)

NP-4690 5384
Applied Physics Lab., Univ. of Wash.
THE ZENITH ANGLE DEPENDENCE OF COSMIC RAY PROTONS. F. M. Charbonnier, W. R. Davis, G. R. Garrison, J. E. Henderson, C. E. Miller, and W. M. Sandstrom. [1952] 69p. (NP-4690)

NP-4693 5385
Applied Physics Lab., Univ. of Wash.
THE MESON COMPONENT OF COSMIC RADIATION. F. M. Charbonnier, W. R. Davis, G. R. Garrison, J. E. Henderson, C. E. Miller, and W. M. Sandstrom. [1952] 109p. (NP-4693)

NP-4694 5386
Applied Physics Lab., Univ. of Wash.
COSMIC RAY PROTONS AT 3.4 KILOMETERS AND THE NUCLEAR ABSORPTION OF PROTONS IN LEAD. Gerald R. Garrison, C. E. Miller, J. E. Henderson, F. M. Charbonnier, D. S. Potter, and W. M. Sandstrom. [1952] 71p. (NP-4694)

NP-4695 5408
Rochester Univ.
SOME K-PARTICLE MASS MEASUREMENTS. D. M. Ritson. [1953] 3p. (NP-4695)

NP-4696 5387
Rochester Univ.
THE ABSORPTION MEAN FREE PATH OF THE HIGH ENERGY NUCLEONIC COMPONENT OF COSMIC RADIATION. M. F. Kaplon, J. Z. Klose, D. M. Ritson, and W. D. Walker. July 6, 1953. 6p. (NP-4696)

NP-4697 5335
Texas Univ.
KINETICS OF THE SURFACE REACTIONS OF METALS. 1. IRON. Donald M. Sowards and Norman Hackerman. July 1, 1953. 34p. (NP-4697)

NP-4698 5359
Carnegie Inst. of Tech.
GALLING AND SEIZING CHARACTERISTICS OF TITANIUM AND TITANIUM-BASE ALLOYS; FINAL REPORT. William C. Leone. June 30, 1953. 30p. (NP-4698; WAL-401/65-22)

NP-4701 5402
De Paul Univ.
SCINTILLATION TECHNIQUES APPLIED TO ELECTRON ENERGY STUDIES. QUARTERLY PROGRESS REPORT [FOR] APRIL 1, 1953 TO JUNE 30, 1953. Edwin J. Schillinger, Jr. 19p. (NP-4701; Quarterly Progress Report 5)

NP-4702 5313
Solid-State and Molecular Theory Group, Mass. Inst. of Tech.
QUARTERLY PROGRESS REPORT NO. 9. July 15, 1953. 71p. (NP-4702)

NP-4703 5403
Armour Research Foundation
FUNDAMENTAL STUDIES ON SCINTILLATION PHOSPHORS: FINAL REPORT. G. M. Burgwald and L. Reiffel. July 9, 1953. 65p. (NP-4703)

NP-4708 5378
Cryogenic Lab., Ohio State Univ.
THERMODYNAMIC PROPERTIES OF THE H_2O MOLECULE FROM SPECTROSCOPIC DATA. Leonard Glatt, Joan H. Adams, and Herrick L. Johnston. June 1, 1953. 29p. (NP-4708; TR-316-8)

NP-4716 5297
Metal Hydrides, Inc.
A BIBLIOGRAPHY ON THE HYDRIDES OF METALS AND METALLOIDS. THIRD SUPPLEMENT. May 1952. 228p. (NP-4716; U-11275)

PR-P-18-E 5404
Chalk River Project (Canada)
ELECTRONICS BRANCH PROGRESS REPORT FOR APRIL TO JUNE 1953. George Cowper. 24p. (PR-P-18-E)

TEI-207 5336
Geological Survey
THE GEOLOGICAL SURVEY'S WORK ON THE GEOLOGY OF URANIUM AND THORIUM DEPOSITS. Arthur P. Butler, Jr. Apr. 1952. 26p., 7 illus. (TEI-207)

TEI-323 5337
Geological Survey
PRELIMINARY REPORT ON GEOLOGY OF THE PHOSPHATE DEPOSITS IN THE CENTENNIAL RANGE, MONTANA-IDAHO. Fred S. Honkala. May 1953. 23p., 6 illus. (TEI-323)

TEI-335 5338
Geological Survey
MONTROSEITE, A NEW VANADIUM OXIDE FROM THE COLORADO PLATEAUS. Alice D. Weeks, Evelyn A. Cisney, and Alexander M. Sherwood. June 1953. 14p. (TEI-335)

TEM-533 5339
Geological Survey
RADON AND HELIUM IN NATURAL GAS. Henry Faul, G. B. Gott, G. E. Manger, J. W. Mytton, and A. Y. Sakakura. June 1953. 17p. (TEM-533)

WADC-TR-52-245 5363
Armour Research Foundation
TITANIUM ALLOYS FOR ELEVATED TEMPERATURE APPLICATION. William F. Carew, Frank A. Crossley, Harold D. Kessler, and Max Hansen. May 1953. 135p. (WADC-TR-52-245)

WADC-TR-53-26 5364
Wright Air Development Center
INVESTIGATION OF HEAT TREATMENT OF COMMERCIAL TITANIUM BASE ALLOYS. L. Luini. April 1953. 75p. (WADC-TR-53-26)

WADC-TR-53-67 5305
Wright Air Development Center
DETERMINATION OF HYDROGEN AND OXYGEN IN INERT GASES. Robert E. Bowman and Charles B. Hartley. May 1, 1953. 22p. (WADC-TR-53-67)

WADC-TR-53-151 5365
Cornell Aeronautical Lab., Inc.
STUDY OF HARD COATING FOR ALUMINUM ALLOYS.
F. G. Gillig. May 1953. 123p. (WADC-TR-53-151)

WADC-TR-53-165 5334
Pennsylvania State Coll. School of Mineral Industries
ALUMINUM TITANATE AND RELATED COMPOUNDS. N. R. Thielke. June 1953. 43p. (WADC-TR-53-165)

WAL-401/103-14 5366
Armour Research Foundation
DEVELOPMENT OF PHASE EQUILIBRIUM DIAGRAMS FOR THE TITANIUM-RICH PORTIONS OF THE TERNARY SYSTEMS Ti-Mn-Al, Ti-Cr-Mo, AND Ti-Mn-Mo. INTERIM TECHNICAL REPORT [FOR] JUNE 1, 1952 – SEPTEMBER 1, 1952. W. Rostoker and D. J. McPherson. 30p. (WAL-401/103-14)

NUCLEAR SCIENCE ABSTRACTS

Vol. 7 Oct. 15, 1953 No. 19

BIOLOGY AND MEDICINE

5260

Cancer Research Inst., New England Deaconess Hospital, Boston

THE PRODUCTION OF L(+) LACTIC ACID BY EHRLICH'S MOUSE ASCITES TUMOR CELLS. Myron Brin. [1953] 9p. (AECU-2614)

Ehrlich's mouse ascites tumor cells were incubated with glucose under an atmosphere of N for 5 hr, after which time the lactic acid formed was extracted, crystallized, and characterized as the Zn salt. Data on water of crystallization, C, H, and ash analyses, and optical rotation indicate that the tumor produced L(+) lactate. (auth)

5261

Worcester Foundation for Experimental Biology

METABOLISM OF DEHYDROEPIANDROSTERONE AND Δ^5-ANDROSTENE-3β,17β-DIOL. Frank Ungar, A. M. Miller, and Ralph I. Dorfman. Worcester Foundation for Experimental Biology, and Western Reserve Univ. School of Medicine, and Lakeside Hospital, Western Reserve Univ. [1951] 22p. (AECU-2617)

In vivo metabolism studies in the guinea pig indicate the conversion of dehydroepiandrosterone to etiocholan-3α-ol-17-one and the conversion of Δ^5-androstene-3β,17β-diol to dehydroepiandrosterone and etiocholan-3α-ol-17-one. In a rheumatoid-arthritic man the oral administration of Δ^5-androstene-3β,17β-diol resulted in the isolation in the urine of dehydroepiandrosterone, androsterone, etiocholane-3α-ol-17-one, and etiocholane-3α,17β-diol. The conversion of dehydroepiandrosterone to Δ^4-androstene-3,17-dione by liver tissue has been demonstrated for the first time. These studies have confirmed the conversion of dehydroepiandrosterone to 11β-hydroxy-Δ^4-androstene-3,17-dione by adrenal tissue and the reduction of dehydroepiandrosterone to Δ^5-androstene-3β,17β-diol by the liver. (auth)

5262

Institute for the Study of Rate Processes, Univ. of Utah

KINETICS OF THE HILL REACTION OF ISOLATED CHLOROPLASTS IN FLASHING LIGHT; STUDIES OF PHOTOSYNTHETIC PROCESSES. Hugh S.A. Gilmour, Rufus Lumry, John D. Spikes, and Henry Eyring. July 1, 1953. 105p. (AECU-2621; Technical Report 11)

The Hill reaction of chloroplast fragments has been studied using continuous and flashing-light techniques. This reaction consists of the photolysis of H_2O and simultaneous reduction of an oxidant by illuminated chloroplast fragments. The significance of velocity-light intensity relationships in continuous light has been discussed in terms of the principle that each primary photoproduct may be allowed only one chance to participate in the Hill reaction. Studies performed with flashing light have revealed the existence of several connected reactions whose rates are differently affected by light intensity, temperature or inactivating procedures. Some of these reactions are concerned with a reservoir, which becomes operative only under conditions of long high-intensity flashes. A kinetic scheme is presented which embodies this reservoir and which can reconcile the data obtained using short light flashes with those obtained using long light flashes. (auth)

5263

Brookhaven National Lab.

THE MAJOR METABOLIC FUELS: BROOKHAVEN SYMPOSIA IN BIOLOGY NO. 5. Sept. 1952. 241p. (BNL-206)

Studies of the metabolism of the major metabolic fuels in animals, many of which utilized tracer techniques as investigative tools, were reported at this conference. Papers were presented on the production, disposal, and regulation of the blood glucose; the effect of competitors on glucose oxidation; the turnover and oxidation of glucose in normal and diabetic animals; the effect of insulin on hepatic utilization of glucose; the effect of insulin on the rate of transfer of sugars across cell barriers; glucose synthesis and oxidation in the alloxan-diabetic and cortisone-treated rat; protein as a metabolic fuel; the metabolism of gluconic acid; the significance of the direct pathway for glucose oxidation; the biosynthesis of fatty acids in cell-free systems; the metabolism of acetone and acetoacetate in the mammalian organism; a potential pathway from C_2 to C_3 and the question of gluconeogenesis from fatty acids; and factors involved in the formation and utilization of ketone bodies. (C.H.)

5264

Atomic Energy Project, Univ. of Rochester

ENZYME SYSTEMS OF THE CELL-SURFACE INVOLVED IN THE UPTAKE OF SUGARS BY YEAST. A. Rothstein. March 24, 1953. 58p. (UR-244)

Studies concerning the mechanism of uptake of glucose by yeast have been reviewed. The investigations deal with the influence of various extracellular ions such as UO_2^{++}, Mg^{++}, Ca^{++}, K^+, H^+, and $H_2PO_4^-$. It has been concluded that glucose is actively taken up by enzymic phosphorylation reactions located in a structural element of the cell in the periphery of the cell. The reactions involved in glucose uptake are assumed to be those of the classical glycolytic scheme. Some of the reactions are exposed to the external environment, and others are sheltered within the cellular structure. The same mechanism can account for the active transport of phosphate into the cell. (auth)

5265

REMOVAL OF RADIOACTIVE GOLD COLLOID BY THE PERFUSED MAMMALIAN LIVER. Robert C. Little and Herbert B. Kelly. Am. J. Physiol. 173, 265-9(1953) May.

A perfused, bile-producing mammalian liver was used to study the clearance of radiogold colloid from the blood during one hepatic passage. The rate at which colloid was removed by the liver, when presented with a nearly constant load without recirculation, increased in a nearly linear manner with time and with the total amount of colloid presented. It was suggested that these findings might result from only part of the hepatic removal mechanism being normally active and that a large dormant portion could be stimulated into activity when needed. No direct relationship was evident between percentage of colloid removed and blood flow. When colloid was presented to the liver for a second circulation, the percentage removed was less than was removed on the first circulation. (auth)

RADIATION EFFECTS

5266

Sloan-Kettering Inst. for Cancer Research
SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. Feb. 1, 1953. 99p. (AECU-2602)

Separate abstracts have been prepared on three sections of this report.

5267

Sloan-Kettering Inst. for Cancer Research
PHYSICS AND BIOPHYSICS. pt. 1 of SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. Feb. 1, 1953. 59p. (AECU-2602(pt.1))

Progress is reported in the use and development of procedures for determining the concentration of isotopes in both the solid and gas phase in biological systems. Methods were developed for measuring the mass of cells and their constituents as an aid in studies of tissue reaction to radiation. Studies reported in which radioactive isotopes were used as tracers include the tissue distribution of Ag, Cs, and Cu in normal and in tumor-bearing rats, and studies in humans of the site of absorption of Co^{60}-labeled B$_{12}$, the utilization of acetate and cholesterol in the synthesis of steroid hormones, the tissue distribution of dietary tritium-labeled cholesterol, the synthesis of fatty acids from acetate, the role of C in the biosyntheses of urea, the chromatographic separation of glutamic and aspartic acids in blood plasma, the tissue distribution of Zn in humans, and blood circulation in health and disease. (C.H.)

5268

Sloan-Kettering Inst. for Cancer Research
PROTEIN CHEMISTRY AND CLINICAL INVESTIGATION. pts. 2 and 3 of SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. Feb. 1, 1953. 25p. (AECU-2602(pts. 2 and 3))

Progress is reported in studies of the metabolic build-up and break-down and the structure of nucleic acids. Isotopically labeled nucleic acid precursors were utilized to study in various species the multiple pathways of biosynthesis of nucleic acids and of the relative extents of renewal and retention of the two main types. Data are presented on studies of the effects of radiation on patients with carcinoma of the thyroid and hyperthyroidism treated with I^{131}; the effect of radiation on coproporphyrin excretion in man; the effect of thyroid-stimulating hormone on the secretion of thyroxine in normal patients, in patients with hyperthyroidism, and in patients with acromegaly; and the effects of radiation on metabolism in man. Work was continued on the identification of iodinated material appearing in the blood stream after administration of large, tissue-destructive doses of I^{131}, factors affecting metabolism in normal and diseased thyroid, the effects of steroid compounds on adrenal and lymphatic tissues in the rat, and studies with labeled hormone preparations. (C.H.)

5269

Sloan-Kettering Inst. for Cancer Research
IMMUNOCHEMISTRY AND RADIOCHEMISTRY. pts. 4 and 5 of SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. Feb. 1, 1953. 8p. (AECU-2602(pts. 4 and 5))

Progress is reported on studies of the localization of anti-tissue antibodies and on the use of immunochemical methods to determine the structure of simple substances in aqueous solution. Investigations of the use of electrophoresis apparatus in the separation of blood serum components are reported. Data are included from studies of the relative effect per r on the alkaline phosphatase of living mouse bone of radiations generated at 100 kvp, 185 kvp, and 1000 kvp. Preliminary results indicate that radiation exerts a depressive effect on alkaline phosphatase activity and a less marked but parallel decrease in the uptake of radioactive Sr. The differences in the biochemical effect of the different qualities of radiation were found to be considerably less than had been anticipated. (C.H.)

5270

Research Foundation, Okla. Agricultural and Mechanical Coll.
[METHODS FOR THE NEUTRALIZATION OR ATTENUATION OF THE EFFECTS OF RADIATION UPON SEEDLINGS]; FINAL REPORT. R. M. Chatters. June 10, 1953. 7p. (AECU-2615)

Results of studies are given for methods employing KCl and other salts for the neutralization or attenuation of the effects of x rays, fast neutrons, and radioactive substances on seedlings. (J.A.G.)

5271

Atomic Energy Project, Western Reserve Univ.
THE MECHANISM OF POTENTIATED LETHAL ACTION OF CERTAIN RADIOISOTOPES IN RATS AND MICE. Hymer L. Friedell, Paul R. Salerno, and Saul A. Rosenberg. Issued July 23, 1953. 22p. (NYO-4020)

A potentiated lethal action was observed in rats and mice when a bone-localizing internal emitter such as P^{32} or Sr^{89} was administered in combination with colloidal Au^{198}. It was noted that the toxicity of colloidal Au^{198} in rats and mice was not altered by splenectomy. However, the lethal action of the bone-seeking radioactive isotopes was found to be clearly more effective in splenectomized animals. This sensitizing action of splenectomy was found to be of the same order of magnitude as the degree of potentiation observed when P^{32} was combined with colloidal Au^{198}. Furthermore, the intensity of the combined lethal action of these two isotopes was found to be the same in both normal and splenectomized animals. Since the acute effects of relatively small doses of colloidal Au^{198} are equivalent to splenectomy, the level of sensitivity of animals which receive Au^{198} in combination with P^{32} or Sr^{89} is reduced to that of splenectomized animals. Splenectomy did not greatly modify the sensitivity of either rats or mice to x rays. Apparently the total body dose in the lethal range severely injures the spleen. Since the bone marrow can partially recover independently, the injured spleen without its special protective function is not a major determinant in survival. It was noted that more than four times as much Sr^{89} could be tolerated by mice with intact spleens as by splenectomized mice. As would be anticipated, it was found that when colloidal Au^{198} was given in combination with Sr^{89}, the potentiation of the lethal effect was also increased approximately four-fold. This potentiation is much more striking in the mouse than in the rat, and these data suggest that the mouse may be unique with respect to the potentiality of the spleen in influencing survival following radiation injury to the bone marrow. (auth)

5272

Atomic Energy Project, Univ. of Calif., Los Angeles
REPEATED INTRAVENOUS INFUSIONS OF OXYPOLYGELATIN (OPG) SOLUTION IN IRRADIATED RABBITS. Lawrence E. Detrick, Virginia Debley, and Thomas J. Haley. Issued July 30, 1953. 14p. (UCLA-265)

Irradiation increased the sensitivity and the mortality rate of rabbits given large and repeated intravenous oxypolygelatin infusion, confirming an earlier report in which tapioca dextrin was similarly used. Initial deaths were attributed to cardiac failure on the basis of necropsy findings and negative histological changes other than lymphoid tissue degeneration characteristic of irradiation injury. Later deaths were accompanied by a volemic plethora and edema, infection, hemorrhage, and translucent amber kidneys. These effects were seen after 3 daily infusions, were intensified 7 to 11 days post-irradiation, and somewhat ameliorated 7 days after infusions were discontinued. Irradiated non-infused control animals all survived and showed no histological evidence of tissue damage when sacrificed 30 days post-irradiation. (auth)

5273

THE INACTIVATION OF DESOXYRIBONUCLEASE BY ELECTRON BOMBARDMENT, DEUTERON BOMBARDMENT AND HEAT. C. L. Smith. Arch. Biochem. and Biophys. 45, 83-90(1953) July.

Experiments on the inactivation of desoxyribonuclease by deuteron and electron bombardment are described, and it is deduced that the sensitive volume of the molecule is a sphere of radius ca. 27 A and molecular weight 62,000. This means that one primary ionization produced anywhere within the molecule causes its inactivation. Heat inactivation, when dry, gives values of 16.000 cal/mole for heat of activation, and −37 cal/mole °K for entropy of activation. The disorganization of the molecule, if any, is much less for dry inactivation than for inactivation from solution. (auth)

5274

THE RELATIVE EFFECTS OF X-RAYS, GAMMA RAYS AND BETA RAYS ON CHROMOSOMAL BREAKAGE IN TRADESCANTIA. J. S. Kirby-Smith and D. S. Daniels. Genetics 38, 475-88(1953) July.

The effects of mixed 1.17- and 1.33-Mev γ rays from Co^{60}, medium energy x rays (60 to 250 kev), and P^{32} β rays (mean energy 400 kev) on chromosomal breakage in Tradescantia have been compared. A number of independent irradiations of Tradescantia pollen using these agents have led to the following results and conclusions: X rays of 60-kev mean energy are twice as effective as Co^{60} γ rays or 400-kev mean energy β rays in producing chromosomal aberrations. One-Mev γ rays and 400-kev mean energy β rays are closely identical in their biological effects on Tradescantia dry pollen. This finding is in agreement with predictions based upon considerations of relative ion density produced by these radiations. A definite nonlinear component in the dose-aberration frequency relation for isochromatid breaks has been observed for the three different agents. This result indicates a definite two-hit component in the aberrations produced. An analysis of the isochromatid dose-aberration frequency curves for the three radiations shows the relative magnitude of the two-hit component to be considerably greater for γ rays or high-energy β rays than for medium-energy x rays. Consideration of relative ion densities supports this result. The dependence of chromosomal breakage on wave length of incident radiation in Tradescantia dry pollen has been confirmed in microspore studies. (auth)

5275

MINIMAL AMOUNT OF X-RAY EXPOSURE CAUSING LENS OPACITIES IN THE HUMAN EYE. David G. Cogan and Knud K. Dreisler. Arch. Ophthalmol. 50, 30-4(1953) July.

Observations are reported on lens changes in a group of 40 patients who had received irradiation of the eye for various reasons. The findings are presented in tabular form. Lens opacities were not found in patients who had received 400 r (energies of 100 kv) or less to the eye. Lens opacities of radiation type were found in one of three patients who had received 600 r, in one patient who had received 800 r, and in one who had received 1,000 r. The time of onset of lens changes in these patients was from 1 to 10 yr. Each of 2 patients who received 2,400 r developed mature cataracts from 1 to 3 yr after irradiation. These studies indicate that the threshold dose for the production of lens opacities is in the order of 600 r when energies of 100 to 200 kv are employed. (C.H.)

5276

EFFECTS OF X-IRRADIATION AND CYSTEINE INJECTION ON ENZYME SYSTEMS OF RAT TISSUES. Marie A. Fischer, Ellen Purvis Coulter, and Michael J. Costello. Proc. Soc. Exptl. Biol. Med. 88, 266-8(1953) June.

Whole-body x irradiation has no effect on the adenosinetriphosphatase, cytochrome oxidase, or lactic dehydrogenase activities of spleen, liver, or kidney of rats. Succinoxidase activity was reduced in the spleen of irradiated rats but remained normal in the liver and kidneys. The in vivo inhibition of spleen succinoxidase by x rays could be prevented by either pre- or post-irradiation injection of l-cysteine. (auth)

5277

STUDIES ON THE THYMUS OF THE MAMMAL. VII. LIPIDS IN THE THYMUSES OF IRRADIATED MICE. Christianna Smith and Edith A. Holst. Anat. Record 116, 123-7(1953) June.

The effect of single, total-body sublethal doses of x radiation on the lipid content of the thymus was investigated in rats from three age groups. It was found that lipids accumulated as soon as 4 hr after exposure, and decreased in amounts after 5 days. Observations are described in detail, and photographs of frozen sections of the thymuses are included. (C.H.)

RADIATION HAZARDS AND PROTECTION

5278

Atomic Energy Project, Univ. of Rochester

STUDIES ON FLASH BURNS: THE PROTECTION AFFORDED BY 2, 4 AND 6 LAYER FABRIC COMBINATIONS. George Mixter, Jr., and Herman E. Pearse. June 4, 1953. 19p. (UR-261)

Fabric interposed between a C-arc source and the skin of Chester White pigs increased the amount of thermal energy required to cause 2+ burns. For the 2, 4, and 6 layers of fabric studied this increase was 3.6, 38, and over 104 cal/cm^2, respectively, when the inner layer of fabric was in contact with the skin. Separation of the inner layer from the skin by 5 mm increased the protective effect of the 2-layer combination from 7.4 to 29 cal/cm^2, provided the outer layer was treated for fire retardation. If the outer layer was not so treated, sustained flaming occurred which in itself added to the thermal burn. (auth)

5279

SUMMARIZED PROCEEDINGS OF A MEETING ON RADIATION PROTECTION—LONDON, JANUARY 1953. E. E. Smith. Brit. J. Appl. Phys. 4, 234-8(1953) Aug.

The highlights of papers presented at a joint meeting of the Industrial Radiology Group of the Institute of Physics and the Hospital Physicists Association on medical and industrial aspects of radiation protection and methods of personnel monitoring are summarized. (L.M.T.)

RADIATION SICKNESS

5280

EFFECTS OF ACUTE WHOLE-BODY X-IRRADIATION ON SALT AND WATER METABOLISM AND THEIR CLINICAL SIGNIFICANCE. J. Z. Bowers, V. Davenport, N. Christensen, and C. J. Goodner. Radiology 61, 97-102(1953) July.

Acute whole-body irradiation at an LD$_{50}$ level in rats is associated with a loss of potassium and gains in sodium and chloride in a radiosensitive tissue. A radioresponsive tissue and a radioresistant tissue do not show comparable changes. The balance between the intake of potassium, sodium and chloride in the food and the loss of these elements in the urine and feces is not different in irradiated rats from that in pair-fed control rats. Parenteral feeding and correction of significant alterations in electrolytes are an essential part of the treatment of the acute radiation syndrome. (auth)

5281

THE EFFECT OF WHOLE BLOOD TRANSFUSION ON DOGS RECEIVING A MAXIMAL SUBLETHAL (LD$_0$) EXPOSURE TO IONIZING RADIATION. R. W. Miller, W. K. Cotton, and S. N. Swisher. Science 118, 111-2(1953) July 24.

An investigation was made of the possible hazards of compatible whole-blood transfusion to dogs suffering acute radiation sickness following a maximal LD$_0$ total-body exposure to x radiation. None of the 20 irradiated, transfused dogs used in the experiment died during a 28-day observation period. It was concluded that the irradiated dog is no more susceptible than normal dogs to transfusion reactions when compatible blood is administered. Precautions necessary to minimize transfusion reactions in dogs are discussed. (C.H.)

RADIOTHERAPY

5282

Atomic Energy Medical Research Project, Western Reserve Univ.

AN EVALUATION OF THE CLINICAL USE OF A Sr^{90} BETA RAY APPLICATOR WITH A REVIEW OF THE UNDERLYING PRINCIPLES. Hymer L. Friedell, C. I. Thomas, and J. S. Krohmer. Issued June 22, 1953. 40p. (AECU-2601)

The general principles of therapy utilizing β rays from the Sr^{90} applicator for benign lesions of the eye are reviewed. These include studies on the physical measurements of the β-ray applicator, biological calibration, and basic tenets of the biological effects of radiation. The Sr^{90} applicator appears to be a useful source of radiation which has been effective in the control of various eye lesions. A summary of 137 cases is presented with an indication of the method of treatment, the response of the various types of corneal lesions, and the applied dose. A dosage schedule is included. (auth)

5283

LOCALIZATION OF RADIOACTIVITY IN REGIONAL LYMPH NODES. Harold F. Berg, William M. Christophersen, Avrom M. Isaacs, and J. Ray Bryant. Arch. Surg. 67, 228-43(1953) Aug.

A colloidal solution of Au^{198} was instilled through a catheter into a selected segment of a lung in 20 dogs. Assay of these dogs, killed at various time intervals, revealed localization of activity within the selected segment of lung and regional lymph nodes. Histologic studies showed radionecrosis produced in proportion to the amount of isotope instilled in the segment of lung. Only minor changes were seen in the lymph nodes. A colloidal solution of Au^{198} was injected into the mucosa of the right intermediate bronchus of eight dogs. Assay revealed extremely high levels of concentration of radioactivity in the regional lymph nodes, a lower level at the sight of injection, and negligible activity elsewhere. A colloidal solution of Au^{198} was injected intramurally into the urinary bladder of 12 dogs. Assay and histologic studies were made on dogs killed at various time intervals ranging from 5 to 15 days. Concentrations of radioactivity were found to be consistently high at the site of injection as well as in the trigone of the urinary bladder and in the regional lymph nodes. Radiogold produced necrosis of the urinary bladder wall at the site of injection. Minor changes were noted in the regional lymph nodes. These results suggest the possibility of a clinical trial in patients with inoperable bronchogenic and bladder carcinoma. (auth)

5284

CRITERIA FOR THERAPY OF MALIGNANT THYROID LESIONS WITH I^{131}. Charles V. Meckstroth and George M. Curtis. Arch. Surg. 67, 187-93(1953) Aug.

Forty-seven consecutive cases of thyroid carcinoma have been studied to determine the criteria for I^{131} therapy. In only three cases was the necessary indication present, that of functioning metastases. In all of these cases the patients received benefit from I^{131} therapy. All lesions were adenocarinomas with colloid formation. No papillary or undifferentiated lesions ever retained enough I^{131} to warrant continued therapy. (auth)

TOXICOLOGY STUDIES

5285

Atomic Energy Project, Univ. of Rochester

TOXICOLOGY OF THE MINOR METALS. Aser Rothstein. June 5, 1953. 35p. (UR-262)

The pharmacology and toxicology of the minor metals and their compounds are presented for inclusion in a textbook of pharmacology. Included in the discussion are the following: Al, Cd, Co, Cu, Ge, Au, Mn, Ni, Pt, Se, Ag, Te, Tl, U, V, Zn, and Zr. A few recent references are given for each metal. (auth)

5286

EFFECT OF POSTURE ON THE ELIMINATION OF RADON IN THE BREATH. E. J. Martin and J. K. W. Ferguson. Science 118, 112-14(1953) July 24.

From a series of experiments on the effect of posture on the elimination of Rn in the breath of subjects carrying appreciable amounts of Ra, it was concluded that exhaled air for Rn determinations should be collected 45 min after the patient assumes a supine position. (C.H.)

TRACER APPLICATIONS

5287

Northwestern Univ. Medical School

INTRAPROSTATIC INJECTION OF RADIOACTIVE COLLOIDS. 1. DISTRIBUTION AND EXCRETION FOLLOWING INJECTION IN THE DOG. John A. D. Cooper, George J. Bulkley, and Vincent J. O'Conor. [nd] 7p. (AECU-2609)

Excretion and distribution of chromic phosphate containing P^{32} and colloidal gold (Au^{198}) after intraprostatic injection in dogs are discussed. Tabulated data are given on the above. Materials and methods for performing the experiment are given. (J.A.G.)

5288

Pittsburgh Univ. School of Medicine

IMMUNOCHEMICAL CROSS REACTIONS OF ALBUMINS AND GAMMA GLOBULINS. Paul H. Maurer. [1953] 8p. (AECU-2610)

Reciprocal in vitro cross reactions between various albumins and γ globulins are shown by quantitative immunochemical techniques. The results obtained with the antisera to human (HSA) and bovine (BSA) albumins indicate that the extent of cross reactions of BSA with anti-HSA sera and HSA with anti-BSA sera is about 3 to 6%, respectively. The results of the cross reaction of the human (HGG) and bovine (BGG) γ globulins indicate the BGG precipitated about 25% of the anti-HGG antibody, and in the reciprocal cross reaction, HGG was also capable of removing about 25% of the antibodies to BGG. However, whereas neither BSA nor HSA reacted with anti-rabbit albumin sera, both BGG and HGG cross reacted with anti-rabbit γ globulin sera in the amounts of 10 and 15%, respectively. (J.A.G.)

5289

Western Reserve Univ. School of Medicine

THE METABOLISM OF RIBONUCLEIC ACID IN NORMAL AND BACTERIOPHAGE-INFECTED ESCHERICHIA COLI. Lionel A. Manson. [1953] 28p. (AECU-2608)

The metabolism of the ribonucleic acid (RNA) of a glycineless mutant of E. coli B has been investigated during growth of the organism and during infection with bactoriophage T4r. Glycine-2-C^{14} incorporation into the purines of RNA was used as an indicator of RNA metabolism. The rate of renewal of endogenous RNA in growing cells and in cells supporting phage multiplication was found to be very slow, and of the same order of magnitude in the 2 instances. The organism contains a ribonuclease. This enzyme degrades the endogenous RNA to dialyzable materials, only if the cell is disrupted either by sonic vibration or phage lysis. Since the rate of renewal of the RNA in these cells is very slow, the enzyme must not be acting on the endogenous RNA in vivo. This argues against the possibility of RNA being converted to desoxyribonucleic acid during growth, and also suggests that RNA is not in a dynamic state in the growing organism. (auth)

5290

A PHOTOGRAPHIC METHOD OF DETERMINING THE DISTRIBUTION OF RADIOACTIVE MATERIAL IN VIVO. Sven A. E. Johansson and Bengt Skanse. *Acta Radiol.* *39*, 317-22(1953) Apr.

A description is given of an apparatus which renders it possible to obtain a photographic picture of the distribution of a radioactive material. A concentration of 10 $\mu c/cm^2$ of the isotope is required. The resolving power seems to be satisfactory for many practical problems. The apparatus consists of a lead plate with a large number of square holes which collimate the radiation, a photographic plate, and a crystal plate which amplifies the radiation effect on the photographic plate. It has been successfully used in studying the distribution of I^{131} in thyroid tissue. (auth)

CHEMISTRY

5291

Oregon State Coll.

ISOTOPIC EXCHANGE REACTIONS IN LIQUID SULFUR DIOXIDE. 3. THE CATALYZED SULFUR EXCHANGE BETWEEN THIONYL BROMIDE AND SULFUR DIOXIDE. Rolfe H. Herber, T. H. Norris, and J. L. Huston. [1952] 24p. (AECU-2606)

It has been found that the addition of a number of ionic halides to the SO_2-$SOBr_2$ system produces a strong catalysis of S exchange. The catalysis is homogeneous, with exchange rates apparently first order in catalyst concentration and zero order in thionyl bromide concentration. $(CH_3)_4NBr$, RbBr, RbCl, CsBr, KBr, and KCl act as catalysts, although the last two are limited by low solubility. Roughly comparable k values, based on the expression, rate = k × (catalyst conc.), are obtained at a given temperature, irrespective of which of the first four catalysts are employed. Average k values for $(CH_3)_4NBr$ are 5.8×10^{-2}/min at 25°, and 6.2×10^{-3}/min at 0°. A representative exchange half time for this catalyst is 80 min at 25° (0.163 millimoles in 9.9 and 1.24 millimoles each of SO_2 and $SOBr_2$). The reaction is interpreted as involving basic catalysis by halide ions. Pyrex glass powder also shows a weak catalysis (half time 307 hr at 25°). (auth)

5292

DuPont de Nemours, E. I., and Co. Explosives Dept., Atomic Energy Div.

THE FORMATION AND DISSOLUTION OF METAL SULFIDES. Herbert A. Pohl. June 4, 1953. 8p. (DP-28)

Experiments showed that FeS, ZnS, and CdS dissolve in acid at a speed proportional to the first power of the H^+ concentration. From this it was concluded that the formation of the sulfides proceeds mainly by the attack of the hydrosulfide ion on the metal ion, and not by the action of either sulfide ion or H_2S molecule. (auth)

5293

Purdue Univ.

PHYSICAL PROPERTIES OF CONCENTRATED NITRIC ACID. W.L. Sibbitt, C. R. St. Clair, T. R. Bump, P. F. Pagerey, J. P. Kern, and D. W. Fyfe. June 1953. 19p. (NACA-TN-2970)

From a review of the literature and additional experimental measurements, recommended values of the physical properties of white fuming HNO_3 were determined for the temperature range of approximately −35 to 300°F. These properties included thermal conductivity, dynamic viscosity, specific heat, density, and vapor pressure. Values were determined within an accuracy of 5% for all physical properties except the vapor pressure. (auth)

5294

Ames Lab.

ACTIVITY COEFFICIENTS OF AQUEOUS METHANOL SOLUTIONS. William S. Brown and Don S. Martin. [June 1951] 27p. (ISC-235)

The methods employed in determination of vapor pressures of liquids are reviewed. The gas-saturation method has been used to determine the partial and total vapor pressures of water-methanol solutions at 0°C. From the vapor pressure data thus obtained, activities and activity coefficients of water and methanol have been calculated, and the results have been plotted against the mole-fraction composition. The data obtained showed a positive deviation from Raoult's law for the solution. The activity coefficient curves have been analyzed and found to satisfy the requirements of the Duhem-Margules equation. These curves have also been fitted with an empirical equation which has made possible extrapolation of the curves to infinite dilution. A discrepancy between the data obtained and the data for higher temperatures has also been discussed. (auth)

5295

Ames Lab.

MAGNETIC STUDIES OF NICKEL COMPLEXES WITH SOME *vic*-DIOXIMES. Roy William Vander Haar and Charles V. Banks. [June 1952] 80p. (ISC-250)

The construction, calibration, and operation of an apparatus for magnetic susceptibility determination based on the Gouy method are described in detail. The water-insoluble Ni(II) complexes of α-benzildioxime, 2,3-butanedionedioxime, α-furildioxime, 1,2-cycloheptanedionedioxime and 1,2-cyclohexanedionedioxime were prepared by adaptation of the analytical procedures in which these reagents are usually used. All were recrystallized from organic solvents, and the magnetic susceptibilities of the crystalline complexes were measured. They were found, without exception, to be diamagnetic, and thus are considered as normal Ni(II) complexes of the square coplanar type. Magnetic and allied spectrophotometric studies were carried out on solutions of the same five complexes in both reactive and nonreactive organic solvents. Stabilities of the complexes toward reaction with pyridine and *n*-butylamine to form an unknown paramagnetic complex were compared. Some tentative suggestions were made as to the nature of the reactions of 1,2-bis(α-furildioximo-*N*, *N′*)nickel(II) with pyridine and *n*-butylamine, on the basis of magnetic and conductance measurements carried out on solutions of this complex in the two solvents. (A.G.W.)

5296

National Bureau of Standards

HEAT CAPACITY OF THE EUTECTIC MIXTURE OF LITHIUM CHLORIDE AND POTASSIUM CHLORIDE FROM THE EUTECTIC TEMPERATURE TO 800°C. Thomas B. Douglas and James L. Dever. Feb. 20, 1953. 14p. (NBS-2303)

Accurate measurements at several temperatures were made of the enthalpy, relative to 0°C, of a liquid mixture of LiCl and KCl having the eutectic composition (55% by wt. of KCl). A Bunsen ice calorimeter was employed, and the measurements covered the region from the eutectic temperature (~350°C) to 800°C. The corresponding heat-capacity values are believed to be correct to within less than 1% throughout this temperature range. (auth)

5297
Metal Hydrides, Inc.
A BIBLIOGRAPHY ON THE HYDRIDES OF METALS AND METALLOIDS. THIRD SUPPLEMENT. May 1952. 228p. (NP-4716; U-11275)

This bibliography, which includes 2690 references, is arranged according to group of the periodic system with the exception of a section that deals with the general theory of hydrides and their formation. Two separate sections on double hydrides are included. References within a particular group are arranged alphabetically according to authors. (J.A.G.)

5298
Rutgers Univ.
SOME OBSERVATIONS ON THE HETEROPOLY ACIDS CONTAINING VANADIUM. E. R. Allen and J. L. Silver. July 16, 1953. 21p. (NYO-3547)

Phosphovanadic acid (PVA), phosphomolybdovanadic acid (PMVA), and similar triple acids are discussed in the light of various coordination theories. Experimental presentations were, for the most part, analyses of crystals grown from various solutions. Preparation of crystals of PVA and a series of solutions containing $NaH_2PO_4 \cdot H_2O$, $Na_2MoO_4 \cdot 2H_2O$, and $Na_3VO_4 \cdot 16H_2O$ are given. Methods for the analysis of P, Mo, and V and extraction results are discussed. Orientation experiments including preparation of ether-H_2O systems of phosphomolybdic acid and the gradual addition of concentrated HCl to an ether-H_2O, 2-phase system of the orange-colored phosphovanadic acid were designed to obtain indications as to the nature of the red, V-containing ether complex. Observations and possible theoretical explanations of the above are given. (J.A.G.)

5299
PHYSICO-CHEMICAL NATURE AND CATALYTIC ACTIVITY OF BORON TRIFLUORIDE COMPOUNDS. Ya. M. Paushkin. Translated from Zhur. Priklad. Khim. 21, 1199-1209(1948). 17p. (AEC-tr-1568)

The molecular compounds of BF_3 with organic and inorganic substances are constructed according to one and the same type: with an ion of 4-valent B forming a bond with a molecule of the uniting substance via an atom of O, N, S, or another atom, capable of giving up an electron. The theory of resonance is used to explain the nature of the compounds. In the case of molecular compounds of BF_3 with hydroxyl-containing molecules, the O atom of the hydroxyl group acts as the ligand, and hence the H atom of the OH group acquires an ionic bond, as in fluoroboric acid, but the place of the fourth F atom in the ion with 4-valent B is occupied by the remainder of the molecule of the uniting substance $H[XOBF_3]$. In connection with this, all the molecular compounds with hydroxyl-containing substances acquire the character of strong acids. The addition of a second molecule of H_2O, ROH, or RCOOH to $H_2O \cdot BF_3$, $ROH \cdot BF_3$, or $RCOOH \cdot BF_3$, is not associated with phenomena of a co-ordinate character but is explained by salt formation of the type of perchloric acid with water or the weaker acids. A general regularity of catalytic activity in alkylation and polymerization of numerous compounds of BF_3 is reported in which the increased effect of the catalyst is explained by the formation of an ionized molecule $H^+[XOBF_3]$; the activity of the catalyst relative to BF_3 increases with increase in the acidity of the compound. This does not exclude ether mechanisms, as, for example, complex-formation in the case of free BF_3 and its compounds with ethers and esters, although in this case the catalytic effect is less. (auth)

5300
AN ISOTOPE EFFECT IN THE OXIDATION OF A SECONDARY CARBINOL. William A. Bonner and Clair J. Collins. J. Am. Chem. Soc. 75, 2308-11(1953) May 20.

When 2-phenyl-1-acenaphthenol-1-C^{14} is oxidized with varying deficient amounts of potassium permanganate, the unoxidized carbinol shows a higher radioactive assay and the oxidation product [8-benzoyl-1-naphthoic-carboxy-C^{14} acid] a lower radioactive assay than the starting carbinol. This is in accord with a normal isotope effect during the oxidation. That this isotope effect occurred during oxidation of the carbinol to the intermediate 2-phenyl-1-acenaphthenone-1-C^{14}, rather than in the further oxidation of this ketone to the acid, is shown by the fact that the ketone itself could be oxidized to the same acid without an isotope effect. Further evidence suggesting the existence of an intermediate ketone during the oxidation of the carbinol is noted in the formation of a derivative of the ketone when the carbinol is oxidized with a deficient quantity of permanganate. A novel use of carbon isotope effect data to elucidate a reaction path is described. (auth)

AEROSOLS

5301
Illinois Univ. Engineering Experiment Station
PARTICLE SIZE DISTRIBUTION IN HYGROSCOPIC AEROSOLS. G. R. Gillespie. May 1, 1953. 58p. (SO-1010; Technical Report 9)

The high-velocity cascade impactor is shown to be a convenient device for determining the particle-size distribution of hygroscopic aerosols in the μ and submicron range in both laboratory and field work. A method is presented for obtaining the particle-number concentration of an aerosol by means of the cascade impactor if the particle-size distribution can be described by the logarithmic probability function. Data are presented showing the effect of the conditions of formation, especially the addition of foreign nuclei, on the particle-size distribution of typical hygroscopic aerosols. Evidence was offered that particles rapidly attain equilibrium with their surroundings. If the number concentration was greater than 1×10^6 particles/cc, the particles continued to grow by coagulation. (auth)

ANALYTICAL PROCEDURES

5302
Atomic Energy Research Establishment, Harwell, Berks (England)
THE ANALYSIS OF SILVER-ZIRCONIUM ALLOYS. G. W. C. Milner and J. L. Woodhead. May 6, 1953. 14p. (AERE-C/R-1170)

A suitable procedure is described for the analysis of Ag-Zr alloys in the composition range from 1 to 99% Ag. The alloy is first dissolved in a mixture of HCl and HNO_3, and the solution is then fumed with H_2SO_4 before being diluted to a definite volume with H_2O. Aliquot portions of this solution are taken, and the Ag and Zr are determined separately. Silver is determined volumetrically by titration with standard NH_4SCN in the presence of HNO_3 with $Fe(NH_4)(SO_4)_2$ as indicator. Zirconium is separated from the Ag by precipitation as the hydroxide with an NH_3 solution. This precipitate is redissolved in HCl, and the Zr is reprecipitated with mandelic acid with subsequent filtration and ignition to the oxide at 960°C. (auth)

5303
Knolls Atomic Power Lab.
A METHOD FOR THE DETECTION OF ENRICHED

URANIUM IN HUMAN URINE. R. Z. Bouton. July 21, 1953. 12p. (KAPL-667(rev.))

An analytical procedure is described for the determination of enriched U in human urine. The method is essentially an ether extraction in which the inorganic residue remaining from a 24-hr urine specimen is dissolved in Al(NO$_3$)$_3$ solution, extracted into di-ethyl ether, and finally deposited on a counting planchet. The U recovery with the analytical method proposed is 86 ± 10%. (auth)

5304

Mineral Engineering Lab., Mass. Inst. of Tech.

A CRITICAL STUDY OF THE SPECTROPHOTOMETRIC DETERMINATION OF ALUMINUM WITH FERRON (7-IODO-8-HYDROXYQUINOLINE-5-SULFONIC ACID). Julia M. Grandfield. Feb. 28, 1951. 28p. (MITG-A-109)

A rapid and fairly reproducible method for the spectrophotometric determination of Al in the presence of all interfering ions is presented. The organic reagent ferron (7-iodo-8-hydroxyquinoline-5-sulfonic acid) is used to develop the Al color for the final optical measurement. The steps necessary for the separation of interfering ions are discussed. An average standard deviation of ±3.3% is obtained on synthetic and laboratory samples. Extreme precautions must be taken to avoid contamination. (auth)

5305

Wright Air Development Center

DETERMINATION OF HYDROGEN AND OXYGEN IN INERT GASES. Robert E. Bowman and Charles B. Hartley. May 1, 1953. 22p. (WADC-TR-53-67)

This report describes tests of a commercial apparatus which was used to determine the amount of O and H impurities in inert gases. The determination consists of measuring the temperature rise which occurs when O and H combine in the presence of O (or H) in the inert gas. The operation of the apparatus was checked by measuring the O and H impurities in a cylinder of welding grade A. O and H impurities as low as 0.001% could be detected. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

5306

ON THE THEORY OF DECOMPOSITION OF SUPERSATURATED SOLUTIONS. I. V. Salli. Translated from Doklady Akad. Nauk S.S.S.R. 89, 61-4(1953). 4p. (NSF-tr-24; D-89-61)

The crystallization center, the concentration of the depleted zone surrounding the center, and the concentration of the mother phase during the decomposition of supersaturated solid solutions are determined. Discussions and calculations are given for the principal cases of crystal growth: crystals growing in the form of a hemisphere with the thickness of the depleted zone increasing as the size of the crystal increases and growth of the crystallization center in such a way that the thickness of the depleted layer remains constant during the isothermal decomposition of the supersaturated solutions. (J.A.G.)

DEUTERIUM AND DEUTERIUM COMPOUNDS

5307

THE VIBRATION-ROTATION SPECTRUM OF HDO. W. S. Benedict, Norman Gailar, and Earle K. Plyler. J. Chem. Phys. 21, 1302-3(1953) July.

The spectrum of HDO has been examined in the range 1.5 to 4.2 μ. Type A and type B rotational transitions have been observed in a single vibrational transition. The properties of close pairs have been mixed owing to Fermi resonance shifts and the circumstance that $\nu_1 \cong 2\nu_2$. Measured values of line frequencies and moments of inertia are tabulated. (K.S.)

5308

THE VIBRATION-ROTATION SPECTRUM OF D$_2$O. W. S. Benedict, Norman Gailar, and Earle K. Plyler. J. Chem. Phys. 21, 1301-2(1953) July.

The spectrum of D$_2$O has been examined in the range 1.25 to 4.2 μ. Five new bands have been observed, and the analysis of the three known bands has been improved. The type B fundamental has been found at 2671.79 cm^{-1}, and its overtone at 5291.55 cm^{-1}. Measured values of line frequencies and moments of inertia are tabulated. (K.S.)

5309

THE VAPOR PRESSURES OF THE DEUTEROMETHANES. George T. Armstrong, F. G. Brickwedde, and R. B. Scott. J. Chem. Phys. 21, 1297-8(1953) July.

Vapor pressures and triple points are given for the four deuterium derivatives of methane in the solid and liquid states. The temperature range covered is 70 to 112°K. (K.S.)

FLUORINE AND FLUORINE COMPOUNDS

5310

THE INTERMOLECULAR FORCE CONSTANTS OF FLUORINE. David White, Jih-Heng Hu, and Herrick L. Johnston. J. Chem. Phys. 21, 1149-52(1953) July.

The intermolecular force constants of gaseous fluorine have been determined from measurements of the second virial coefficients in the region 80 to 300°K. On the assumption that gas imperfection results only from binary collisions of spherical nonpolar molecules whose potential is of a given form, the force constants obtained were r_0 = 3.61 ± 0.04 A and e_0/k = 121 ± 3°K. These force constants yield viscosities in good agreement with the experimental data of Kanda if the high temperature point is discarded. (auth)

5311

THE INFRARED SPECTRUM OF CF$_3$D. Santiago R. Polo and M. Kent Wilson. J. Chem. Phys. 21, 1129-31(1953) July.

CF$_3$D was prepared in high purity and its infrared spectrum investigated. The fundamental frequencies are $\nu_1(a_1)$ = 2257 cm^{-1}, $\nu_2(a_1)$ = 1111 cm^{-1}, $\nu_3(a_1)$ = 693 cm^{-1}, $\nu_4(e)$ = 1210 cm^{-1}, $\nu_5(e)$ = 977 cm^{-1}, $\nu_6(e)$ = 502 cm^{-1}. Thermodynamic functions have been calculated with the usual assumptions. (auth)

LABORATORIES AND EQUIPMENT

5312

DuPont De Nemours, E. I., and Co. Explosives Dept., Atomic Energy Div.

A PHOTO-AUTOMATIC TITRIMETER. D. N. Sunderman and R. C. Propst. June 12, 1953. 12p. (DPSPU-53-8)

A photo-automatic titrimeter has been developed to detect the change in color of a solution at the end point of a titration in which the appropriate visual indicator has been added. The change in color results in a voltage change across a photocell. The voltage change is amplified and fed into the input of a Model H Beckman automatic titrator. The titrator is preset to the end point potential and its anticipation adjusted to add small increments of titrant as the end point is approached. A possible application of the photo-automatic titrimeter is the volumetric determination of U using Ce(SO$_4$)$_2$ and ferroin indicator. The photo-automatic titrimeter also offers many possibilities for remote-control titrations. (auth)

MOLECULAR STRUCTURE

5313

Solid-State and Molecular Theory Group, Mass. Inst. of Tech.

QUARTERLY PROGRESS REPORT NO. 9. July 15, 1953. 71p. (NP-4702)

The relative merits of the tight-binding approximation and the orthogonalized plane-wave method for studying energy bands in molecules are discussed. The use of the orthogonalized plane-wave method for finding electronic energy bands in Cr_2 is discussed. The methods previously applied to the two-electron example of ferromagnetism for a one-dimensional case are extended to a two-dimensional case. The application of the spin-operator method to configuration interaction is discussed, and a configuration-interaction treatment of the antiferromagnetic molecule $(MnOMn)^{++}$ is presented; also associated with this problem was an extension of Hund's rule to determine the multiplicity of the lowest state and an investigation of the O_2 ground electronic wave function. Discussions are presented of the nuclear electric quadrupole interaction in the KCl molecule and interstitial diffusion in the diamond molecule. Atomic multiplet separations were computed for atoms with uncompleted 3p and 3d shells. Results are presented of calculations of atomic energy levels for Mg in various states of ionization and excitation. Further calculations were made concerning the structure of the H_2O and ethane molecules. (For preceding period see NP-4551.) (L.M.T.)

RADIATION CHEMISTRY

5314

Wisconsin Univ.

EFFECT OF DENSITY IN THE REGION OF THE CRITICAL TEMPERATURE ON THE CHEMICAL PRODUCTS OF THE $Br^{79}(n,\gamma)Br^{80}$ REACTION ON BROMOTRIFLUOROMETHANE. W. E. Rice and J. E. Willard. [1952] 12p. (AECU-2613)

The fraction of the Br activated by the (n,γ) nuclear process in homogeneous mixtures of CF_3Br and one mole % Br_2 which becomes stabilized as CF_3Br, appears to increase linearly from about 1 to 12% with increase in density from 0.007 to 1.4 g/cm^3. There is no discontinuity in this yield at the critical temperature. In the absence of elemental Br the yield is higher and less reproducible. The yield from solid CF_3Br at –183° C is about 66%. CF_3Br does not show detectable exchange of Br with Br_2 when illuminated with a 1000-watt lamp for 1 hr at 100°C. The molar volumes of CF_3Br have been determined at a series of temperatures. (auth)

5315

THE DECOMPOSITION OF METHANOL-C^{14} UNDER THE INFLUENCE OF ITS OWN RADIATION. W. J. Skraba, J. G. Burr, Jr., and D. N. Hess. J. Chem. Phys. 21, 1296 (1953) July.

Analysis of C^{14}-labeled CH_3OH, stored for long periods in closed containers, indicated the presence of methane. Ethylene glycol, glycerol, and erythritol were also found in the ratio of 1360/14.9/1.00. Determinations showed that a methane yield of 5.4 ± 0.3 gas molecules per 100 ev were produced. (K.S.)

5316

THE STABILITY OF A COMPLEX ION; A LABORATORY EXPERIMENT IN RADIOCHEMISTRY AND ION EXCHANGE. Paul Kruger and Jack Schubert. J. Chem. Educ. 30, 196-8(1953) April.

Material covered by this report includes the determination of the composition and stability of a complex ion in solution, the use of synthetic organic ion exchangers, and simple radiochemical technique. The experiment consists of the measurement of the distribution of carrier-free radioactive Sr between a buffered solution containing varying concentrations of citric acid and a cation exchange resin immersed in the solution. The stability quotient of the complex ion formed between Sr^{++} and the citrate ion is calculated from differences in the uptake of Sr^{++} by the cation exchanger from solutions of various citrate concentrations. The measurements are made under simulated physiological conditions, i.e., a pH of 7.25 and ionic strength of 0.16. Practically all of the citric acid is present as a trivalent ion when the pH is greater than 7.0. (J.A.G.)

RADIATION EFFECTS

5317

Brookhaven National Lab.

X-RAY MEASUREMENTS OF RADIATION DAMAGE IN BLACK PHOSPHORUS. D. L. Chipman and B. E. Warren, Massachusetts Inst. of Tech. and G. J. Dienes, Brookhaven National Lab. [1953] 4p. (BNL-1479)

Samples of orthorhombic black P were irradiated in the Brookhaven reactor for one month at a temperature of about 50°C. X-ray measurements on the irradiated samples showed a definite but small broadening of the (001) peaks and an expansion of 0.03 ± 0.02% in the c axis. In addition, a large number of extra lines not belonging to the pattern of black P and not seen in the pattern of the undamaged material were found. The nature of the change producing these lines is discussed. (A.G.W.)

5318

STUDIES ON THE GAMMA-RADIATION-INDUCED POLYMERIZATION OF ACRYLONITRILE. Irving A. Berstein, Earle C. Farmer, Walter G. Rothschild, and Florence F. Spalding. J. Chem. Phys. 21, 1303-4(1953) July.

The effects of Co^{60} γ radiation on the polymerization of acrylonitrile monomer have been investigated in order to determine the feasibility of utilizing the pure monomer as a visual-indicating chemical dosimeter. Experimental results are compared with theory, and it is found that monomer conversion deviates from theory in the dose-rate region below 100 r/hr. (K.S.)

5319

CHEMICAL STATE OF THE ATOM, CAUSED BY NUCLEAR TRANSFORMATIONS. An. N. Nesmeyanov, L. A. Sazonov, and I. S. Sazonova. Uspekhi Khim. 22, 133-78(1953). (In Russian)

The effect of neutrons, protons, and electrons on the atoms of molecules is reviewed, and the chemical reactions caused by the transformation of atoms are discussed. 176 references. (J.S.R.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

5320

Hanford Works

AN INTRODUCTION TO THE ANALYTICAL CHEMISTRY OF PLUTONIUM. G. B. Barton. May 21, 1953. Decl. June 9, 1953. 26p. (AECD-3531; HW-28136)

The actinide family of elements is briefly discussed to relate the chemistry of Pu to that of the more familiar elements. Pu exhibits valence states of 3, 4, 5, and 6 in aqueous solution. In contrast to U whose stable valence state is 6, Pu has a major valence state of 4, which may be in equilibrium with one or all of the remaining states. The existence of this multiplicity of valence states and the influence of complexing agents on their stability and rates of disproportionation contribute greatly to the complexity of behavior of Pu. The relationship of this behavior to the determination of Pu by redox titration, absorption spectrophotometry, and radiochemical techniques is discussed. 30 references. (auth)

5321

Ames Lab.

STRUCTURE OF THE RARE EARTH METALS AT LOW TEMPERATURES. J. R. Banister, S. Legvold, and F. H. Spedding. Mar. 1953. 44p. (ISC-342)

Three members of the rare-earth-metal series are known to be ferromagnetic at low temperatures. These are Gd, Dy, and Er. The Curie point of Gd is 289°K while that of Er is 56 ± 2°K. Dy shows a magnetic anomaly at about 180°K and a ferromagnetic Curie point at 105°K. The structure of these metals in the neighborhood of their Curie points was investigated by x-ray analysis. This study was undertaken because the onset of the ferromagnetic condition is often accompanied by anomalous behavior of the coefficient of thermal expansion. The nature of the problem required a low-temperature x-ray camera which could be used for a wide temperature range. Such a camera of the Debye-Scherrer type was designed and constructed. The x-ray sample was held at the desired exposure temperature by a gas stream which flowed by it. To reduce the heat leak, the camera interior was insulated except for a small free volume through which x rays passed. The x-ray samples were prepared by first annealing filings in a vacuum and then mixing NaCl with the filings before placing them in an x-ray capillary. The NaCl was used as an internal standard. Exposures were obtained of Gd in a temperature range from 106 to 349°K. For Dy the temperature range in which exposures were obtained was from 49 to 300°K. The exposure temperature range of Er was from 43 to 301°K. The structure of all three metals was found to be hexagonal close-packed for all exposures. The average values for the lattice constants at room temperature are tabulated. Anomalous behavior of the same type was noted for all three metals. Below the temperature region near the Curie point the c_0 axis appeared to increase with decreasing temperature. In the case of Dy and Er the rate of decrease of the a_0 axis with temperature was somewhat larger below the Curie point. (auth)

SORPTION PHENOMENA

5322

Ames Lab.

ADSORPTION OF ALIPHATIC ALCOHOLS AND ACIDS FROM BINARY AQUEOUS SOLUTION BY NON-POROUS CARBONS. Roy P. Craig and Robert S. Hansen. Mar. 1953. 104p. (ISC-309)

The adsorption of the normal aliphatic alcohols and the normal fatty acids, containing 2 to 7 C atoms, from their aqueous solutions on 3 different nonporous C absorbents has been investigated. Discussions are given on the adsorption from the aqueous phases of the alcohols and acids which are not totally miscible with H_2O; the surface excess obtained from dilute aqueous solutions of all members of the series, both miscible and immiscible, for a given absorbent and type absorbate; the surface excess of the slightly soluble and miscible acids and alcohols; adsorption of the organic component and H_2O from organic phases with graphon, DAG-1, and spheron-6 for miscible and immiscible systems; corresponding determination of the isotherm for immiscible alcohols and the isotherm for the acids; determinations of solubilities of H_2O in the alcohols and acids and solubilities of the alcohols and acids in water; and adsorption of alcohols and acids from aqueous solution on nonporous carbons. (J.A.G.)

SPECTROSCOPY

5323

Los Alamos Scientific Lab.

THE INFRARED SPECTRA AND STRUCTURE OF LiOH, $LiOH \cdot H_2O$ AND THE DEUTERIUM SPECIES. REMARK ON FUNDAMENTAL FREQUENCY OF OH^-. Llewellyn H. Jones. [nd] 13p. (AECU-2625; LADC-1476)

The infrared spectrum of a thin path of solid LiOH and $LiOH \cdot H_2O$ (undeuterated, partially deuterated, and completely deuterated) has been observed. The spectra indicate that both hydrogens from each water molecule are used to form strong hydrogen bonds in the hydrate. The results serve to substantiate the crystal structures previously determined by x-ray diffraction. For LiOH the absorption maximum occurs at 3678 ± 1 cm^{-1}; the fundamental frequency of OH^- in LiOH is 3839 ± 1 cm^{-1}. The spectrum of $LiOH \cdot HDO$ exhibits an anomaly in the bending frequency of HDO. (auth)

TRANSURANIC ELEMENTS AND COMPOUNDS

5324

CHEMISTRY OF THE TRANS-URANIUM ELEMENTS AND THE ACTINIDE THEORY. P. Nast and T. Krakkaĭ Uspekhi Khim. 22, 583-627(1953). (In Russian)

A review of the chemical and physical characteristics of the trans-U elements is given. 156 references. (J.S.R.)

URANIUM AND URANIUM COMPOUNDS

5325

FURTHER URANIUM DETERMINATIONS ON SEA WATER SAMPLES. Gerta Koczy. Translated by John B. Lyons from Österr. Akad. Wiss. Math.—naturw. Kl, Sitzber. Abt. IIa 158, 113-22(1950). 13p. (TEM-305)

An abstract of this article appears in Nuclear Science Abstracts as NSA 5-5637.

WASTE DISPOSAL

5326

Johns Hopkins Univ.

CONTAMINATION OF PLUMBING BY LOW-LEVEL RADIOISOTOPE WASTES: [FINAL REPORT]. Albert P. Talboys. May 1, 1952. 31p. (NYO-4010; JHUX-7)

Solutions of I^{131}, Sr^{89}, and P^{32} at low levels of activity were passed through a 9-ft section of plumbing, simulating an actual waste drain line. The pipes and fittings retained on the average about 16% of the I^{131} and Sr^{89} present in the solutions, and nearly 22% of the P^{32}. This retention is attributed in large part to selective adsorption of the isotopes on the metal surfaces. In general, the more complex fittings were more highly contaminated than the straight sections. Flushing the system with water removed nearly 30% of the I^{131} and up to 40% of the Sr^{89}, but even continuous flushing did not dislodge more than about 25% of the P^{32}. However, removals of more than 90% of the P^{32} were accomplished by the use of highly alkaline solutions (NaOH and Na citrate). Nitric acid rinses were similarly effective in reducing the Sr^{89} contamination. (auth)

ENGINEERING

HEAT TRANSFER AND FLUID FLOW

5327

Atomic Energy Research Establishment, Harwell, Berks (England)

HEAT TRANSFER FROM A STAINLESS STEEL TUBE TO A SURROUNDING WATER COOLED COPPER TUBE UNDER VARYING AIR PRESSURES AND TEMPERATURES. W. E. Simmons. June 9, 1953. 18p. (AERE-E/R-1205)

Experimental results are given of the heat loss from a vertical heated tube surrounded by a concentric outer tube immersed in a stagnant water bath. The experiments covered a range of temperatures up to 450°C and air pressures in the annulus from atmospheric pressure down to 10^{-2} mm of Hg. It is shown that the heat transfer is largely by thermal conduction across the air space; natural convection currents do not play a significant part. This agrees with theoretical predictions. Radiation losses have also been separated. In no case did the temperature of the outer tube exceed the water temperature by more than 25°C. (auth)

5328
Livermore Research Lab., Calif. Research and Development Co.
SURVEY OF METHODS FOR THE DETERMINATION OF THE SUBSONIC FLOW CHARACTERISTICS OF HEATED GASES.
J. E. Mahlmeister and M. F. Katzer. Sept. 16, 1952. 33p. (MTA-19)

A survey is given of the methods used for the determination of subsonic flow characteristics of heated gases. This study includes the general problem of variable heat flux and cross-sectional area in systems which must consider friction. The effects of other boundary conditions such as constant wall temperature, uniform heat flux, adiabatic flow with and without friction are also considered. (auth)

5329
Langley Aeronautical Lab., NACA
A STUDY OF THE STABILITY OF THE INCOMPRESSIBLE LAMINAR BOUNDARY LAYER ON INFINITE WEDGES.
Neal Tetervin. Aug. 1953. 41p. (NACA-TN-2976)

Hartree's numerical solutions of the boundary-layer equations for the flow over infinite wedges are used to confirm a result previously obtained by the use of Schlichting's approximate method for the calculation of the laminar boundary layer; namely, that in a region of falling pressure a thick velocity profile can be more stable than a thin profile although the velocity at the edge of the boundary layer and the pressure gradient are the same for both profiles. The investigation also leads to the inference that the calculated effects of a change in boundary-layer thickness on the stability and on the local roughness Reynolds number should be essentially unchanged by replacing the Schlichting single-parameter family of velocity profiles by the Hartree single-parameter family of velocity profiles. (auth)

5330
Atomic Energy Project, Univ. of Calif., Los Angeles
SOME PHENOMENA ASSOCIATED WITH SUPERSONIC LIQUID JETS. Brian Dunne and Benedict Cassen. July 24, 1953. 14p. (UCLA-263)

Supersonic liquid jets were produced in air by means of a spring-loaded injector. At high jet velocities another type of breakup seems to occur besides the classical Rayleigh surface-tension breakup, and the sinuous aerodynamic breakup. Rotationally symmetric waves are formed and appear to "break" analogous to wind-produced waves on a body of water. The rate of cavitation of jets in water was studied for several jet velocities above the speed of sound in air. (auth)

MATERIALS TESTING

5331
Langley Aeronautical Lab., NACA
PRELIMINARY INVESTIGATIONS OF STRENGTH CHARACTERISTICS OF STRUCTURAL ELEMENTS AT ELEVATED TEMPERATURES. Eldon E. Mathauser and Charles Libove. June 10, 1953. 12p. (NACA-RM-L53EO4a)

Methods for predicting structural strength of columns, plates, and stiffened panels at uniform elevated temperature are surveyed. For columns and plates, the material stress-strain curve is needed in determining short-time strength where creep effects are negligible, and, for stiffened panels, an "effective" stress-strain curve is useful. A method for determining the long-time, or creep, strength of columns is given. Some data obtained from creep tests on stiffened panels are included. (NACA)

PUMPS

5332
Atomic Energy Research Establishment, Harwell, Berks (England)
A. C. LIQUID METAL PUMPS FOR LABORATORY USE.
D. A. Watt. Mar. 19, 1953. 27p. (AERE-CE/R-1089)

Two types of single-phase a-c electromagnetic pump for liquid metals are described, a leakage reactance model and a combined pump and transformer. The NaK-alloy test rig is briefly described, and methods of pump construction are detailed. Test results and curves for pumping the NaK alloy at temperatures below 70°C are included, and it is shown that the combined form is the more effective pump. One of these models, with a single loop secondary winding, had a maximum efficiency of 11% with an output of 10 gpm at 13 psi pressure rise, and an input of 650 watts, 9.0 to 7.5 amps at 180 to 195 volts. A maximum pressure rise of nearly 30 psi is recorded for the first model of this form. (auth)

WASTE DISPOSAL

5333
Air Cleaning Lab., Harvard Univ. School of Public Health
PERFORMANCE CHARACTERISTICS OF WET COLLECTORS. Melvin W. First, Glenn A. Johnson, Richard Dennis, Sheldon Friedlander, and Leslie Silverman. Mar. 11, 1953. 76p. (NYO-1587)

The performance characteristics of an experimental cyclone scrubber and a commercial dynamic inertial-type wet collector were investigated to obtain information concerning the fundamental principles of wet collection and to develop criteria for predicting and improving the performance of practical collecting devices. Although there are disadvantages to wet-dust collection, some types of wet devices can be adapted to continuous and remote-control cleaning of radioactive aerosols. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

5334
Pennsylvania State Coll. School of Mineral Industries
ALUMINUM TITANATE AND RELATED COMPOUNDS. N. R. Thielke. June 1953. 43p. (WADC-TR-53-165)

The preparation of Al titanate and its structural, thermal, and mechanical properties were investigated. A melting temperature of 1865°C and a region of instability between 1260°C and about 860°C, plus extreme thermal-expansion anisotropy in the crystal, give rise to unusual properties in the matured crystalline aggregate. These include negative expansion coefficients, marked resistance to thermal shock, thermal-expansion hysteresis, and low transverse strength. The expansion behavior and strength of matured aggregates are variously altered by heat treatment, by kiln atmosphere, and by incorporation of minor amounts of oxides or glasses. Aluminum titanate is recommended as a thermal-shock-resistant refractory material in applications involving low tensile loads and oxidizing conditions at temperatures within its stability ranges. Fabricated shapes may serve satisfactorily as nozzle-diaphragm blades, flame-tube liners, refractory coatings, or other ceramic elements of combustion systems. (auth)

CORROSION

5335
Texas Univ.
KINETICS OF THE SURFACE REACTIONS OF METALS.
1. IRON. Donald M. Sowards and Norman Hackerman.
July 1, 1953. 34p. (NP-4697)

The reaction of pure Fe with dilute acetic acid was studied in a closed system with a N atmosphere at 34°C. The aqueous solution was continuously sprayed onto the metal for periods of time ranging up to 24 hr. The extent of reaction was determined gravimetrically, and for constant exposure conditions was found to be directly proportional to the exposure time. The reaction rate was a function of the solution acidity, the rate of flow and replenishment of the liquid on the metal, the composition of the gaseous atmosphere, the temperature at which the reaction occurred, and the nature of the adherent reaction products. The change in reactivity, as well as changes in the type of localized activity on the metal surface, with changing exposure conditions may be satisfactorily explained in terms of the defect structure of the film on the metal. Previously reported evidence related to the occurrence, identity, and properties of these films is correlated with the present observations. It is concluded that ferrous acetate, ferrous carbonate, monobasic ferric acetate, and dibasic ferric acetate would protect the underlying metal if they were formed as adherent, continuous films on the surface; and that magnetite and ferric oxide (hydrous) in various proportions form solid solutions, the protective properties of which are a function of the liquid-solution acidity. (auth)

GEOLOGY AND MINERALOGY

5336
Geological Survey
THE GEOLOGICAL SURVEY'S WORK ON THE GEOLOGY OF URANIUM AND THORIUM DEPOSITS. Arthur P. Butler, Jr. Apr. 1952. 26p., 7 illus. (TEI-207)

The wide variety of materials investigated in this study are embraced by five somewhat arbitrary groups of related types of deposits as follows: (1) Igneous rocks, pegmatites, veins, and related deposits; (2) Deposits in sandstone of carnotite, Cu-U, and other minerals; (3) Other consolidated sedimentary rocks; (4) Placers; and (5) Natural fluids. Much of the Geological Survey's work has been concentrated in geologic study and exploration of the carnotite deposits in sandstone, but many hundreds of occurrences of U, or of materials that might possibly be uraniferous, have been examined since 1944. Several bodies of igneous rock among at least 100 tested contain 0.005 to 0.01% equivalent U. The study of uraniferous vein deposits has included examination of scores of metalliferous veins and few fluorite veins, mainly in 8 western states; detailed studies of some districts; and increasing attention to the association of U with other elements, of zonal arrangement of U in metalliferous districts, and of wall-rock alteration. These studies have resulted in discovery of new occurrences in Colorado, in better definition of the position of pitchblende shoots in metalliferous districts in the Colorado Front Range and of the assemblages of minerals that may be guides to new occurrences, and in a more satisfactory basis for appraising resources. Similar investigations have been made of Th-bearing veins in Calif., Colo., Mont., and Idaho. Intensive study of uraniferous sedimentary rocks following earlier reconnaissance has served to determine the most uraniferous parts of the Chattanooga shale, of some Florida and western phosphatic rocks, and of some western lignites and to define some of the relevant geologic features of these potentially significant low-grade sources of U. Some other black shales as radioactive as the Chattanooga have been noted, but they are thinner or less persistent. Most of the numerous other sedimentary rocks tested are not appreciably radioactive. Search for natural fresh water that might be a source of U or a clue to the presence of uraniferous rocks is in progress; and the significance of Rn in some natural gases and of radioactive scale on some oil-well pipes and of the relation between U and some oils and asphaltites are being studied. Investigations for U and Th in Alaska have consisted mainly of reconnaissance of areas containing types of rock or an assemblage of metals thought to be possibly favorable for U. (J.E.D.)

5337
Geological Survey
PRELIMINARY REPORT ON GEOLOGY OF THE PHOSPHATE DEPOSITS IN THE CENTENNIAL RANGE, MONTANA-IDAHO. Fred S. Honkala. May 1953. 23p., 6 illus. (TEI-323)

The Centennial Range of southwestern Montana and adjoining parts of Idaho is a large east-trending fault block, upthrown on the north side, and bounded on the north by the downthrown Centennial Valley block. The strata in the range dip gently south under the Snake River lava fields. In the Centennial Range the Phosphoria formation of Permian age is divisible into five members, designated A to E from bottom to top of the formation. It is about 200 ft thick in the range, where it disconformably overlies the Pennsylvanian Quadrant formation and grades into the overlying Triassic Dinwoody formation. The A, C, and E members include carbonate and siliceous rocks, and the B and D members contain phosphate rock. The B member contains as much as 6 ft or more of high-grade (31% or more P_2O_5) phosphate rock, mostly in one layer which is the chief potential producing horizon. The D member contains a few thin high-grade beds of phosphate rock interspersed through a sequence of black shale. Fluorine and trace amounts of U and other elements are present in the phosphate rock of both members. The gently dipping phosphate rock beds generally are overlain by less than 500 ft of younger strata within the mapped area. Underground mining would seem to be the best method for potential exploitation of the deposit, but further exploration including core drilling and trenching is needed. Reserves of high-grade phosphate rock in the Centennial Range may total several scores of millions of tons. (auth)

5338
Geological Survey
MONTROSEITE, A NEW VANADIUM OXIDE FROM THE COLORADO PLATEAUS. Alice D. Weeks, Evelyn A. Cisney, and Alexander M. Sherwood. June 1953. 14p. (TEI-335)

Montroseite, a new V mineral named from Montrose Co., Colo., has been found in four mines in western Colo. and in two mines in eastern Utah. It is black, opaque, submetallic, and occurs in microscopic bladed crystals of the orthorhombic dipyramidal class. The axial ratio is a:b:c = 0.509:1:0.310, the common forms are b [010], m [110], p [121], and a large vicinal form is approximately [0, 10, 1]. The observed specific gravity is 4.0 and the calculated specific gravity is 4.15. The composition is essentially VO(OH), with some Fe commonly substituted for V. Partial oxidation to VO_2 has taken place. Chemical analyses and x-ray-diffraction data are given. Single crystal study indicated that the space group symmetry is $Pbnm(D_{2h}^{16})$. (auth)

5339
Geological Survey
RADON AND HELIUM IN NATURAL GAS. Henry Faul, G. B. Gott, G. E. Manger, J. W. Mytton, and A. Y. Sakakura. June 1953. 17p. (TEM-533)

Rn has been discovered in some of the He-bearing natural gas in the U. S. So far, the Rn content of about 500 producing gas wells has been explored. Concentrations up to 500×10^{-12} curies per liter were observed. The more highly radioactive wells are clustered in several groups. Measurements of Rn content under conditions of transient gas flow and theoretical analysis of steady-state conditions indicate that the Rn originates in the immediate vicinity of the bore in most wells. This result is tentatively confirmed by γ-ray logs in two wells, but so far it has not been possible to obtain adequate samples of the gas-producing beds. A few grains of uraniferous solid hydrocarbon and radioactive petroleum residues have been found disseminated in several drill samples of dolomite from above the gas-producing zones. At the present time, it is not clear whether the Rn concentration is sufficient to explain the high He content of the gas. The research continues, and comprehensive studies of subsurface geology and reservoir characteristics of the gas field are in progress. (auth)

5340
[Division of Raw Materials, AEC]
URANIUM-FLUORITE ASSOCIATION IN THE TODILTO LIMESTONE, GRANTS, NEW MEXICO. Paul F. Kerr and Harry Dahl. [nd] 6p. (RME-3051)

A memorandum is presented on a preliminary inspection on the surfaces of a specimen of Todilto limestone. Microscopic observations indicated a fine-grained, essentially lithographic limestone containing spherical to ovate outlines presumably the remnants of microscopic organisms. The original limestone appears to have been replaced by black fluorite. X-ray-diffraction measurements identified fluorite and indicated the presence of calcite as an impurity in the sample. A one-gram sample of black Todilto fluorite yielded a γ-ray count of 397 per min. Two possibilities concerning the character of the U association are considered briefly. (J.E.D.)

METALS AND METALLURGY

5341
Armour Research Foundation
PHASE DIAGRAMS OF ZIRCONIUM-BASE BINARY ALLOYS; REPORT 11. THE ZIRCONIUM-NITROGEN SYSTEM; REPORT 1. APRIL 1, 1953–JUNE 30, 1953. R. F. Domagala and D. J. McPherson. June 30, 1953. 9p. (COO-187)

Progress is reported in studies of phase relationships in the Zr-N binary system up to 50 at. % N. Experimental procedures are summarized. Analytical techniques for determination of N in Zr-N alloys are described. (For preceeding period see COO-181.) (C.H.)

5342
Ames Lab.
TEMPERATURE DEPENDENCE OF ELECTRICAL RESISTIVITY OF METALS. Lazarus Weiner, Premo Chiotti, and H. A. Wilhelm. Dec. 1952. 83p. (ISC-305)

The purpose of this investigation was to study the temperature dependence of electrical resistivity of Th and Ti and to determine whether or not the slope of the resistance vs. temperature curve of these metals exhibits anomalous discontinuities. Fe was also studied in an attempt to reproduce previously reported results on discontinuities in the slope of the resistance vs. temperature curve for this metal. The results of this investigation indicate that the resistivity of iodide Ti is 49.6 microhm-cm at 20°C and 167.5 microhm-cm at 850°C. The temperature coefficient of electrical resistance from 0° to 100°C was found to be 0.00397. The resistivity of electrolytic Fe was found to be 9.7 microhm-cm at 20°C and 105.5 microhm-cm at 900°C. The Curie point was observed to be at 756°C. The resistivity of Th containing 0.03% Be, 0.01% Al, 0.11% C, and 0.01% N was found to be 21.7 microhm-cm at 20°C and 64.1 microhm-cm at 965°C. The temperature coefficient of electrical resistance from 0° to 100°C is 0.00277. The resistivity of Th containing 0.06% Be, 0.01% Al, 0.04% C, and 0.02% N was found to be 20.4 microhm-cm at 900°C. The temperature coefficient of electrical resistance of this metal from 0° to 100°C was found to be 0.00333. In addition to inspection of resistance vs. temperature plots, two rigorous methods were utilized to study the existence of discontinuities in slope of the resistance vs. temperature curves of Th, Ti, and Fe. These methods entailed plotting R_x/R_{pt} against temperature and the application of the least squares method with the closeness of fit criteria to the data. The results obtained in this investigation in general do not show the existence of discontinuities in the slope of the resistance vs. temperature curves of these metals over the temperature ranges studied, except possibly in the case of Ti. For Ti, visual observation of the plotted data and the analytical method indicate the existence of discontinuities, while the plot of R_{ti}/R_{pt} against temperature gave no indication for their existence. Further, the addition of more terms to the equation for the smooth curve would probably reduce the significance of the results obtained by the analytical method. (auth)

5343
Ames Lab.
CORRELATION OF VICKERS HARDNESS NUMBER, MODULUS OF ELASTICITY AND THE YIELD STRENGTH FOR DUCTILE METALS. Emil Arbtin, Jr. and Glenn Murphy. June 1953. 30p. (ISC-356)

An investigation was undertaken to determine whether or not a relationship existed between the yield strength, modulus of elasticity, and the Vickers hardness number for various metals. Tests were also performed to determine whether or not the Vickers hardness number was independent of the time interval and applied load used in testing. Equations were derived for determining the ultimate strength of a metal from its Vickers hardness number for three modulus-of-elasticity ranges. Results indicated that there is no discernible relationship between the yield strength and the Vickers hardness number and that there is a linear relationship between the ultimate strength and the Vickers hardness number for materials with approximately the same modulus of elasticity. The relationship can be used for predicting the ultimate strength of a metal from a knowledge of its Vickers hardness number, and the Vickers hardness number is dependent on the length of time of the testing cycle and the magnitude of the applied load. (auth)

5344
Ames Lab.
ELECTRODEPOSITION OF METALS OF SODIUM TUNGSTEN BRONZE CRYSTALS. Dante Stirpe. [July 20, 1953] 2p. (ISC-384)

An investigation was made to determine whether some of the more common metals could be plated to Na-W bronze crystals. The metals chosen were Cu, Ni, Co, Fe, Sn, and Zn. The composition of the electrolytes used and the approximate max. current densities which gave good metallic films are tabulated. (J.A.G.)

5345
Knolls Atomic Power Lab.
A STUDY OF THE EFFECTS OF CYCLIC THERMAL STRESSES ON A DUCTILE METAL. L. F. Coffin, Jr. June 3, 1953. 129p. (KAPL-853)

The results of a study of cyclic strain and fatigue failure arising from cyclic thermal stresses are reported. By means of a test apparatus a cyclic temperature is imposed on a thin tubular test specimen subjected to complete longitudinal constraint. Hence, the cyclic strain is the independent variable. The following studies are reported: effect of thermal stress cycling on strain hardening and life-to-failure for a fixed mean temperature, effect of degree and kind of previous cold work on strain hardening and cycles-to-failure, effect of mean temperature on thermal stress cycling, effect of period of cycle on cycles-to-failure, effect of prior strain cycling on stress-strain characteristics, and effect of stress concentrations on fatigue by cyclic thermal stresses. The significance of factors such as hysteresis, Bauschinger effect, strain hardening, strain aging, and fatigue crack formation are discussed, and a mechanism is described to relate these factors. Evidence is presented to show that strain hardening is not an important factor in the problem. The concept of total plastic strain is discussed. (auth)

5346

Carbide and Carbon Chemicals Co. (K-25)

METALLOGRAPHIC STUDY ELECTROLESS NICKEL PLATE ON VARIOUS MATERIALS. W. W. Latham. Dec. 11, 1952. 9p. (KLI-1852)

5347

Metallurgical Project, Mass. Inst. of Tech.

PROPERTIES OF BERYLLIUM EXTRUDED AT 330°C AND ANNEALED AT HIGHER TEMPERATURES. S. V. Arnold. June 6, 1949. 6p. (MIT-SVA-23)

5348

Langley Aeronautical Lab., NACA

STRUCTURAL EFFICIENCIES OF VARIOUS ALUMINUM, TITANIUM, AND STEEL ALLOYS AT ELEVATED TEMPERATURES. George J. Heimerl and Philip J. Hughes. July 1953. 16p. (NACA-TN-2975)

Efficient temperature ranges are indicated for two high-strength Al alloys, two Ti alloys, and three steels for some short-time compression-loading applications at elevated temperatures. Only the effects of constant temperatures and short exposure to temperature are considered, and creep is assumed not to be a factor. The structural efficiency analysis is based upon preliminary results of short-time, elevated-temperature, compressive stress-strain tests of the materials. The analysis covers strength under uniaxial compression, elastic stiffness, column buckling, and the buckling of long plates in compression or in shear. (auth)

5349

National Bureau of Standards

THE HEAT CAPACITY OF LEAD FROM 0° TO 900°C, AND THE HEAT OF FUSION; THE HEAT CAPACITY OF THE LEAD-BISMUTH EUTECTIC ALLOY FROM 150° TO 800°C. Thomas B. Douglas and James L. Dever. Apr. 18, 1953. 26p. (NBS-2544)

Using a container of stainless steel type 446, the enthalpy of a sample of 99.9% pure Pb, relative to 0°C, was measured at 10 temperatures up to 900°C, using a Ag-core furnace and an ice calorimeter. The heat of fusion and the heat capacity of crystalline and liquid Pb were derived from the enthalpy data. The smoothed heat-capacity values are estimated to be accurate to within 1%. Comparisons with previously published measurements are made. Using the absolute entropy as derived from low-temperature heat-capacity measurements, the relative enthalpy, relative free energy, entropy, and heat capacity are tabulated at intervals over the temperature range 298 to 1200°K. Using the same container, apparatus, and method, the enthalpy of a sample of the Bi-Pb eutectic alloy (54.9% Bi by weight) was measured at 6 temperatures from 150 to 800°C. In this case, unlike the pure Pb, the alloy continued to evolve heat in the calorimeter for many hours. For this reason it was found necessary to extrapolate the heat evolution to infinite time, and as a result the heat capacity values found are much less reliable than those of pure Pb. (auth)

5350

Engineering Research Inst., Univ. of Mich.

TOOL LIFE VERSUS NOSE RADIUS WHEN TURNING TITANIUM. L. V. Colwell. Jan. 1953. (NP-4675; Report 7)

Cutting speed-tool life tests were made when turning Ti with 18-4-1 HSS tools with a range of nose radii. The work materials were SAE 1045 hot-rolled steel, type 304 stainless steel, and Ti grades RC 130B and Ti 150A. All tests were made dry at a feed of 0.006 ipr and a depth of 0.050 in. All four work materials show very little sensitivity to changes in tool nose radius when tested with optimum side rake angle. The greatest sensitivity to nose radius is shown by the SAE 1045 steel and the least by the grade RC 130B Ti, with 304 stainless steel and grade Ti 150A titanium intermediate. The optimum nose radius appears to be about 0.025 in. for a 0.050-in.-deep cut at a feed of 0.006 ipr. Improved heat-transfer characteristics resulting from increased nose radius appear to be offset by less favorable rake angle in the direction of chip flow. The sensitivity of cutting speed to changes in nose radius appears to be directly proportional to the level of energy release manifest in the product of the cutting speed and the cutting force. (auth)

5351

Brush Development Co.

DEVELOPMENT OF TITANIUM ALLOY POWDER PRODUCTION; INTERIM TECHNICAL REPORT [FOR] AUGUST 15, 1951 TO FEBRUARY 28, 1953. Harry W. Dodds. 24p. (NP-4676)

Progress is reported on the powdering of Ti and Ti alloy scrap. Use of Ti sponge in an attrition mill gave a product which was ductile after sintering. Grain sizes of −30 to +150 mesh were achieved using a coolant medium of ice water at a temperature less than 5°C. Preliminary trials indicate the feasibility of producing good powder from pure Ti sponge in a mutilator without the need of ice water. Production of Ti powder from iodide material was not practical in large quantities due to the high ductility of the material. Hydrided Ti sponge broke up readily when ground in an attrition mill but sintering this material always produced undesirable O, H, and N content. A determination of the types of contamination to be encountered in Ti alloy scraps is outlined. (K.S.)

5352

Engineering Research Inst., Univ. of Mich.

THE CUTTING CHARACTERISTICS OF TITANIUM; PRELIMINARY REPORT. L. V. Colwell and W. C. Truckenmiller. Dec. 1952. 30p. (NP-4679; Report 1)

A series of preliminary machining tests was made to evaluate the general characteristics of Ti in relation to SAE 1045 steel and type 304 stainless steel. The observations included chip formation, micro-hardness, tool life, and cutting forces. It was found that Ti work-hardens more superficially than some other metals, has little or no tendency to form a built-up edge, and forms very thin chips relative to the thickness of the cut. The specific energy consumption is of the same magnitude as for medium-carbon and low-alloy steels. (J.E.D.)

5353

Engineering Research Inst., Univ. of Mich.

MECHANICAL PROPERTIES OF MACHINABILITY PROGRAM WORK MATERIALS. L. V. Colwell and W. C. Truckenmiller. Dec. 1952. 39p. (NP-4680; Report 2)

Four alloys of Ti, hot-rolled SAE 1045 steel, and type 304 stainless steel were selected as work materials to be studied in the machinability investigation. Tensile specimens were made and tested and Brinell hardness tests run to provide supporting information on the materials as machined. The results of the tests are tabulated. (auth)

5354

Engineering Research Inst., Univ. of Mich.

EFFECT OF SIDE RAKE ANGLE ON TOOL LIFE IN

TURNING TITANIUM (HIGH-SPEED-STEEL TOOLS). L. V. Colwell. Jan. 1953. 62p. (NP-4681; Report 3)

The results of a study of the influence of both cutting speed and tool side rake angle when cutting with high-speed-steel tools are presented. The work included machining studies of four grades of Ti. Hot-rolled SAE 1045 steel and type 304 stainless steel were tested to provide a basis for comparing the performance of Ti with metals for which machining practice has become fairly well established. Results are tabulated. (J.E.D.)

5355

Engineering Research Inst., Univ. of Mich.

EFFECT OF SIZE OF CUT ON TOOL LIFE IN TURNING TITANIUM. L. V. Colwell. Jan. 1953. 56p. (NP-4682; Report 4)

Cutting-speed, tool-life curves were obtained with 18-4-1 high-speed steel tools at feeds of 0.003, 0.006, and 0.012 ipr with a depth of 0.020, 0.050, 0.100, and 0.150 in. at a constant feed of 0.006 ipr. All tests were run dry. The interrelationships of cutting speed, tool life, feed rate, and depth of cut for optimum tool-rake angle are summarized. The sensitivity of cutting speed to changes in feed, depth of cut, and tool life is less than linear. The sensitivity is greatest for changes in feed rate and least for changes in tool life. Conversely, the tool life is most sensitive to changes in cutting speed and least sensitive to changes in depth of cut. The cutting speeds for optimum rake angle should be reduced 20 to 25% for rake angles in the range of 0 to 15°. (auth)

5356

Engineering Research Inst., Univ. of Mich.

CUTTING SPEED VERSUS TOOL LIFE WHEN SHAPING TITANIUM WITH HIGH-SPEED-STEEL TOOLS. L. V. Colwell and R. E. McKee. Jan. 1953. 22p. (NP-4683; Report 5)

The machining of Ti 75A, RC 130B, and Ti 150A was successfully performed with single-point tools in a shaper. The dependence of tool life on cutting speed was orderly and predictable. The results obtained in these tests indicated a reasonable degree of similarity in performance as compared to the single-point tool turning of these materials. The speeds used for a given tool life favor the Ti 75A over the Ti 150A and the RC 130B. The slopes of the tool-life lines obtained in these tests favor the alloy materials as compared to the commercially pure Ti 75A. Results of the cutting-speed, tool-life tests with HSS tools under the conditions of cut used indicate the following speed ranges for a tool life of 1 to 40 min or total elapsed time of 2.6 to 195 min depending on length of stroke: Ti 75A, 76 to 160 fpm; Ti 150A, 60 to 79 fpm; RC 130B, 34 to 45 fpm. (auth)

5357

Engineering Research Inst., Univ. of Mich.

POWER HACKSAW OPERATIONS ON TITANIUM AND ITS ALLOYS. Frank Sowa and L. V. Colwell. Jan. 1953. 33p. (NP-4684; Report 6)

Power-hacksawing tests were run on Ti grades Ti 75A, RC 130B, and Ti 130A. All tests were made with 4 pitch saws on a commercial machine operating at 3 different speeds. The saw materials represented were W high-speed steel and Mo high-speed steel. All tests were made with 1:20 emulsion of soluble oil in water. (auth)

5358

Purdue Univ.

METALLURGICAL STUDIES IN THE SUB-MICROSCOPIC RANGE (thesis). John Frederick Radavich. May 1953. 85p. (NP-4685)

Various techniques used in electron microscopy, electron-diffraction studies, and x-ray-diffraction studies on Fe and steel are described. Special techniques for metallographic relocation of the same spot and electrolytic stripping of oxide films are described. Data are included from studies of grain boundaries in ingot Fe, carbide and nitride precipitation in α Fe, sigma-phase precipitation in heat-resistant alloys, and oxide-film formation in stainless steel. 51 figures. (C.H.)

5359

Carnegie Inst. of Tech.

GALLING AND SEIZING CHARACTERISTICS OF TITANIUM AND TITANIUM-BASE ALLOYS; FINAL REPORT. William C. Leone. June 30, 1953. 30p. (NP-4698; WAL-401/65-22)

Additional data are presented from rubbing tests on Ti and Ti alloys to determine their dry seizing and galling characteristics. Results indicate that: (1) dry friction coefficients for Ti materials are unusually high when compared to those of babbit, Al, and steel, (2) for a large range of rubbing speeds, the coefficient of friction decreases with increasing speeds, and (3) galling does not seem to occur at a specific load and speed. Efforts were made to determine the thermal aspects of the friction problem by using the rubbing specimens as elements of a thermocouple for finding the contact temperature. (For preceding period see NP-4256.) (L.M.T.)

5360

THE DEPENDENCE OF THE DIFFUSION COEFFICIENT ON ATOMIC INTERACTION IN METALS AND ALLOYS. I. Ya. Dekhtyar. Translated from Doklady Akad. Nauk S.S.S.R. 89, 49-52(1953). 4p. (NSF-tr-25; D-89-49)

Equations and data are given as evidence that not only the energy of activation of diffusion but also the diffusion coefficient are determined primarily by the nature and magnitude of the interatomic binding in metals and alloys. The diffusion equation is derived and applied to specific metals and alloys. (J.A.G.)

5361

Sylvania Electric Products, Inc., Atomic Energy Div.

SOLID STATE BONDING OF ALUMINUM AND NICKEL. S. Storchheim, J. L. Zambrow, and H. H. Hausner. Issued July 8, 1953. 45p. (SEP-132)

The solid-state bonding of Al and Ni was studied as a function of temperature, pressure, and time at pressure. This was done by means of tensile tests and intermetallic penetration rates. The initial results indicated that as the temperature for reaction was raised, tensile strength increased, reached a maximum, declined, and then leveled off. Plots of the log of penetration coefficients vs. the reciprocal of absolute temperature were straight lines. As the pressure was increased for various isotherms, the tensile strength showed: incipient bonding occurring at 400°C, increasing very sharply at 450 and 500°C; at 550°C increasing slowly and to a lower maximum than for the 450 and 500°C temperatures; and at 600°C, rising slowly from a relatively moderate maximum strength. The penetration coefficient was found to decrease as the pressure increased. This decrease was more rapid as the temperature of the reaction was raised. It was found that a zero penetration coefficient occurred at 500°C if the pressure were high enough, namely, over 26 Tsi. Suppression of the alloy zone formation caused tensile strength to rise. Increased pressure did not apparently change the slope of the log P vs. 1/T curves. Increased time at a pressure of 11 Tsi for various isotherms caused tensile strength to rise to a maximum and then slowly decline from this value. The greatest tensile strength was found to occur at four min for all the isotherms used. Metallographic investigation showed two intermetallic phases at the Al-Ni bond interface. (auth)

5362

General Electric Research Lab.

THE TENSILE CHARACTERISTICS OF UNALLOYED ZIR-

CONIUM AT LOW AND MODERATE TEMPERATURES. J. H. Keeler. May 1953. 46p. (SO-2510; RL-892)

True-stress vs. true-strain curves and engineering data are presented, showing the influence, within prescribed limits, of some test variables and metallurgical variables on the tensile properties of unalloyed Zr (rolled and annealed crystal bar and arc-melted, welded, and annealed crystal bar). Composition and preparation of each are also given, as well as tabulated comparisons of each. (J.A.G.)

5363

Armour Research Foundation

TITANIUM ALLOYS FOR ELEVATED TEMPERATURE APPLICATION. William F. Carew, Frank A. Crossley, Harold D. Kessler, and Max Hansen. May 1953. 135p. (WADC-TR-52-245)

The theoretical aspects of the development of Ti alloys for use at elevated temperatures are presented. The results of a preliminary tensile-test survey of binary alloys are given. These results indicate that Al is one of the most promising strengtheners of Ti at elevated temperatures. Therefore, Ti-Al alloys were used as a base for ternary alloys which were surveyed by means of the hot-hardness test. From the results of this survey 12 ternary alloys and two binary Ti-Al alloys were selected for further differentiation by creep rupture testing. Some creep rupture results at 425 and 550°C are reported and give considerable promise for the development of alloys having equivalent if not better properties than type 403 stainless steel (13 Cr, balance Fe). Concurrently with the hot-hardness survey programs, stabilization studies were made as an aid in developing heat treatments for these alloys. Oxidation studies were made on some of the alloys and are reported. The results show that generally the oxidation rate decreases with time. Also, the results indicate that at 550 and 675°C the oxidation resistance of some of the alloys may be as good as that of type 403 stainless steel. (auth)

5364

Wright Air Development Center

INVESTIGATION OF HEAT TREATMENT OF COMMERCIAL TITANIUM BASE ALLOYS. L. Luini. April 1953. 75p. (WADC-TR-53-26)

An exploratory survey of the heat-treatment response of commercial Ti alloys (Ti-150A, RC-130B, RC-130A, and MST-3Al-5Cr alloys) shows a wide range of possible hardness and microstructural characteristics. The hardening is primarily dependent on the solid state transformation of the β phase. An age-hardening reaction which is apparently associated with β decomposition and precipitation has been shown. Brittleness and notch sensitivity appear to be characteristic of age hardening to high hardness. Low ductility is shown by the MST-3Al-5Cr alloy and the Ti-150A alloy exhibits notch sensitivity. Tensile strengths up to 191,000 psi for Ti-150A, 194,000 psi for RC-130B, and 192,000 psi for MST-3Al-5Cr have been demonstrated. Elongations in the range of 2 to 8% were shown for these high strengths. Stresses imposed by the machining operation appear to lower the observed endurance limit. (auth)

5365

Cornell Aeronautical Lab., Inc.

STUDY OF HARD COATING FOR ALUMINUM ALLOYS. F. G. Gillig. May 1953. 123p. (WADC-TR-53-151)

A study has been made of the effects of hard oxide coatings produced by the MHC process on the properties of five wrought and two cast Al alloys. Coating thicknesses ranging from 0.0005 to 0.005 in. were studied. Of the many properties that were studied, the abrasion resistance of the coatings and their effect on the fatigue strength of the parent metal are the most significant. The abrasion resistance of the hard coatings is far in excess of that of coatings produced by standard anodizing treatments and has been demonstrated to be equal to or better than that of thin cyanide coatings on steel. In addition to this, the coatings impart increased corrosion resistance to the Al alloy surface. The abrasion resistance decreases with exposure to humidity and atmospheric conditions, but proper post treatments, other than boiling H_2O which is used for sealing regular anodized coatings, will undoubtedly prevent this. The most serious shortcoming of the coatings has been found to be their drastic lowering of the fatigue strength of the coated alloy. Decreases as much as 65% in the base metal fatigue strength have been found. The effect is not proportional to coating thickness, and coatings of 0.001 in. produce practically the same effect as 0.005-in. coatings. (auth)

5366

Armour Research Foundation

DEVELOPMENT OF PHASE EQUILIBRIUM DIAGRAMS FOR THE TITANIUM-RICH PORTIONS OF THE TERNARY SYSTEMS Ti-Mn-Al, Ti-Cr-Mo, AND Ti-Mn-Mo. INTERIM TECHNICAL REPORT [FOR] JUNE 1, 1952–SEPTEMBER 1, 1952. W. Rostoker and D. J. McPherson. 30p. (WAL-401/103-14)

The phase boundaries of the solid state in the system Ti-Cr-Mo have been re-checked at critical points. A high-temperature allotropic modification of the phase $TiCr_2$ has been identified. The $\beta/\alpha + \beta$ surface in the system Ti-Mg-Mo has been mapped. The Mg-rich portion of the binary Ti-Mg system has been found to require re-investigation. Several isothermal sections and vertical sections of the system Ti-Al-Mg are presented. (auth)

5367

PRELIMINARY EXPERIMENTS ON THE ELECTRODEPOSITION OF TITANIUM AND ITS ALLOYS. N. N. Gratsianskii and E. P. Vovkogon. Translated by E. R. Hope from Zapiski Inst. Khim. Akad. Nauk. U.R.S.R. 7, 173-5(1940). 4p. (AEC-tr-1591)

Research was undertaken on methods of depositing coatings of pure Ti and Ti-Zn and Al-Ti alloys. It was found that in an electrolyte composed of sulfanylic acid and Ti oxide and with a Pt or Ti-Zn anode, Ti is deposited on a Cu cathode in a thin layer up to 1μ thickness at a current density of 0.1 amp/dm^2 and temperature of 20°C. With molten salts and a Ti-Zn anode, a layer of Ti-Zn alloy is deposited on Fe or Cu cathodes at a current density of 0.5 amp/dm^2 and temperature of 300°C. (J.E.D.)

5368

THE OXIDATION OF MAGNESIUM AND ITS ALLOYS AT HIGH TEMPERATURES. I. A. Makolkin. Translated from Zhur. Priklad. Khim. 24, 460-70(1951). 11p. (AEC-tr-1596; AERE Trans. 11/3/5/291)

Oxidation studies were made on Mg, Al, and Zn in air at 400 to 600°C and on two Mg-Al-Zn-Mn alloys at 400 to 500°C in air, N_2, CO_2, and SO_2. An adsorption balance which permitted weighing samples without removing them from the furnace was used in all experiments except those involving SO_2. The Mo spring of the balance might have been oxidized by SO_2. Tables and graphs are presented which show gain in weight of samples as a function of time at each temperature. It was found that increase of Al content in Mg alloys increased their rate of oxidation in air, N_2, CO_2, and SO_2. Owing to the formation of a protective film of carbonates and sulfates, the mechanical properties of Mg alloys were improved by treatment with CO_2 and SO_2. (J.A.G.)

5369

ELECTRON THEORY OF METALS. II. ELECTRONS IN THE PERIODIC POTENTIAL FIELD. Arnold Sommerfeld and Hans Bethe. Translated from Hanbuch der Physik 24, Pt. 2., 499-579(1953). 144p. (AEC-tr-2055)

5370
THEORETICAL AND EXPERIMENTAL STUDY OF THE KINETICS OF GAS-SOLID REACTIONS. Jean-Michel Dunoyer. Translated by C. A. Horton and L. F. Parsly from Ann. chim.(Paris) (12) 6, 165-219(1951). 63p. (AEC-tr-2056)

The process following those of diffusion, applying in the case where the solid is a powder, were considered in a study of the kinetics of gas-solid reactions. Conditions were defined under which the influence of diffusion was practically eliminated. These considerations were supported by a detailed calculation of the kinetics of a gas-solid reaction in the case where the solid is pulverized and where certain previously defined experimental conditions are realized. The theoretical conceptions were checked by an experimental study of the reduction of molybdic oxide by gaseous H. The apparatus, methods of measurement, and experimental procedure are described. Results are discussed and illustrated by graphs. (C.H.)

5371
EFFECT OF PLASTIC DEFORMATION ON SUBSEQUENT DECOMPOSITION IN ALUMINUM ALLOYS. N. N. Buinov and L. I. Podrezov. Translated from Doklady Akad. Nauk S.S.S.R. 88, 665-8(1953). 4p. (NSF-tr-41; D-88-665)

The effect of plastic deformation on the internal decomposition of several Al alloys is determined. Previous investigations on other alloys have shown that surface decomposition phenomena often differ from internal effects. (cf. NSA 7-4600). Results of experiments show that while decomposition in the surface layers of selected alloys differs from that in the inner layers, the residual stresses are distributed throughout the alloy without any preferential localization. (K.S.)

5372
CAUSES OF THE EFFECT OF SMALL DISSOLVED ADMIXTURES ON THE KINETICS OF THE AGING OF ALLOYS. V. I. Arkharov, B. N. Varskoi, and N. N. Skornyakov. Translated from Doklady Akad. Nauk. S.S.S.R. 89, 1003-6 (1953). 4p. (NSF-tr-45; D-89-1003)

Aging kinetics in supersaturated solid solutions were investigated. Analysis of the phenomenon is approached by a study of the changes in degree of supersaturation of a mixture by the addition of a third component and preferential accumulation within intercrystalline transition zones. The accelerated aging of Ag-Cu solid solutions by addition of Sb, and Al-Cu solid solutions by addition of Ag and Zn, is studied. It is concluded that the aging process considered is due to internal adsorption of these mixtures. (K.S.)

5373
FRONTAL DIFFUSION IN IRON OF COMMERCIAL PURITY. V. I. Arkharov, K. A. Yefremova, S. I. Ivanovskaya, A. K. Shtolts, and B. A. Yunikov. Translated from Doklady Akad. Nauk S.S.S.R. 89, 269-71(1953). 3p. (NSF-tr-48; D-89-269)

The diffusion of Ni, Pd, Cu, Cr, and several other elements in Fe is studied. Particular attention is given to preferential intercrystalline boundary-zone accumulation and this effect on diffusion across boundaries and within the Fe crystal. Some elements are found to exhibit a preferential diffusion along grain boundaries. The effect of alloying materials on the preferential diffusion is discussed. (K.S.)

5374
THERMAL CAPACITY OF ALUMINUM-ZINC ALLOYS IN THE CRITICAL RANGE OF THE DECOMPOSITION OF A SOLID SOLUTION. V. A. Kholler and K. G. Khomyakov. Doklady Akad. Nauk S.S.S.R. 90, 199-200(1953). (In Russian)

The decomposition of solid solutions of Al-Zn alloys is discussed and graphed. The thermal capacity of the alloy with 50 wt.% Zn is investigated in the temperature range 250 to 350°. Tests were run on both the annealed and cold-worked alloy. (J.S.R.)

PHYSICS

5375
Argonne National Lab.
THE HEAT CAPACITY OF THORIUM DIOXIDE FROM 10 TO 305°K. THE HEAT CAPACITY ANOMALIES IN URANIUM DIOXIDE AND NEPTUNIUM DIOXIDE. Darrell W. Osborne and Edgar F. Westrum, Jr. July 1953. 12p. (ANL-5085)

The heat capacity of ThO_2 was determined from 10 to 305°K in an adiabatic calorimeter. The enthalpy, entropy, and free energy were calculated from the heat-capacity data and are tabulated for several temperatures. At 298.16°K the entropy and the enthalpy are, respectively, 15.593 ± 0.02 cal deg^{-1} $mole^{-1}$ and 2524.4 ± 3 cal $mole^{-1}$. By assuming the lattice entropy of UO_2 and of NpO_2 to be equal to the entropy of ThO_2, the magnetic entropy contributions at 298.16°K were evaluated as 3.0 cal deg^{-1} $mole^{-1}$ for UO_2 and 3.6 cal deg^{-1} $mole^{-1}$ for NpO_2. These values are somewhat greater than the spin-only values ($R \ln 3 = 2.18$ cal deg^{-1} $mole^{-1}$ for UO_2 and $R \ln 4 = 2.75$ cal deg^{-1} $mole^{-1}$ for NpO_2). The entropies of the other isomorphous actinide dioxides at 298.16°K are estimated to be (in cal deg^{-1} $mole^{-1}$) 17.8 for PaO_2, 19.7 for PuO_2, 20.0 for AmO_2, 20.3 for CmO_2, 20.6 for BkO_2, and 20.3 for CfO_2. Anomalies have been observed in the heat capacity of UO_2 at 28.7°K and of NpO_2 at 25.3°K that are presumably related to the magnetic behavior of these substances. In order to obtain an estimate of the contribution of the lattice vibrations to the heat capacities of UO_2 and of NpO_2, so that the magnetic contributions can be resolved, measurements have been made of the heat capacity of ThO_2. Because of the similar structure and the small percentage differences between the lattice dimensions and between the atomic masses, it seems reasonable to assume that the heat capacity of ThO_2 is a good approximation for the lattice contribution to the heat capacities of UO_2, NpO_2, and other actinide dioxides. (J.E.D.)

5376
Ames Lab.
THE THERMODYNAMIC FUNCTIONS OF POTASSIUM VAPOR. Maurice Griffel. [July 17, 1953] 3p. (ISC-365)

The thermodynamic functions of the monatomic and diatomic species of K vapor from 100 to 3000°K have been calculated from spectroscopic data, assuming ideality of the vapors. The Gibbs function, enthalpy function, heat capacity, and the dissociation equilibrium constant are tabulated. The entropy can be calculated from the first two. (L.T.W.)

5377
National Bureau of Standards
HEAT CAPACITY OF FOUR ALLOYS: NICHROME V AND STAINLESS STEELS TYPES 347 AND 446, 0° TO 900°C; MONEL, 0° TO 300°C. Thomas B. Douglas and James L. Dever. Feb. 20, 1953. 26p. (NBS-2302)

The method employed in determining the heat capacity consisted of heating the sample in a furnace to each of several known temperatures and then dropping it into an ice calorimeter that measures the heat evolved in cooling the sample to 0°C. (For a complete description of the apparatus and method see J. Research Natl. Bur. Standards 45, 23(1950)). Because the alloys were not themselves in containers, two substantial corrections had to be made, namely, the heat due to other parts of the system entering the calorimeter and the heat lost during the drop through the region between the furnace and calorimeter. (L.M.T.)

5378

Cryogenic Lab., Ohio State Univ.
THERMODYNAMIC PROPERTIES OF THE H_2O MOLECULE FROM SPECTROSCOPIC DATA. Leonard Glatt, Joan H. Adams, and Herrick L. Johnston. June 1, 1953. 29p. (NP-4708; TR-316-8)

The spectroscopic analysis of H_2O vapor has been reviewed, and the thermodynamic properties of an ideal gas composed of H_2O molecules are computed and tabulated between 1 and 6000°K. The values listed in the tables include the effect of nuclear spin and were computed for equilibrium mixtures of ortho and para constituents. Only the ground electronic state was considered. In the computation, the latest and most extensive set of vibrational-rotational constants and empirical energy levels were used to obtain a set of "psuedo" energy levels with appropriate statistical weights. These were approximately equivalent to the actual complete set of vibrational-rotational levels up to the points of rotational level cut-off. The actual complete set consists of nearly a million levels, of which only a few thousand are empirically known or can be accurately computed. (auth)

5379

ON THE BEHAVIOR OF FERROELECTRICS NEAR THE CURIE POINT. N. P. Bogoroditsky and T. N. Verbitskaya. Translated from Doklady Akad. Nauk S.S.S.R. 89, 447-9 (1953). 3p. (NSF-tr-44; D-89-447)

Aging changes in the dielectric constants of three ferroelectric ceramics are studied near and below the Curie point. Ferroelectrics with Curie point near the experiment temperature (20°C) showed aging changes up to 35%, whereas those materials with Curie point very much higher showed little change. An explanation of this behavior is based upon spontaneous polarization and the orientation of domains. This approach is confirmed by experiments on aging and dielectric behavior due to heat treatment and the application of electric fields. (K.S.)

AEROSOLS

5380

Princeton Univ.
ELECTRON MICROSCOPIC STUDY OF THE THERMAL DECOMPOSITION OF IRON PENTACARBONYL. Paul H. Till, Jr. and John Turkevich. Apr. 1, 1953. 20p. (NYO-3430)

This report deals with an investigation of the formation of Fe aerosols by the thermal decomposition of Fe pentacarbonyl in the gas phase. The effects of varying temperature and concentration on the particle size, morphology, and aggregation were examined by means of an electron microscope having a resolution greater than 25 A. A definite dependence on the concentrations of carbonyl vapor is found. (auth)

COSMIC RADIATION

5381

Applied Physics Lab., Univ. of Wash.
A SEARCH FOR ANOMALOUS ABSORPTION OF HIGH ENERGY NEGATIVE PARTICLES. W. R. Davis, G. R. Garrison, J. E. Henderson, C. E. Miller, and W. M. Sandstrom. [1953] 72p. (NP-4687)

In this experiment no negative particles in the momentum interval 0.37 to 1.65 bev/c were found to stop in 10 cm of Pb. If the absolute intensity were such that one would expect on the average to have detected one such particle during the course of the experiment, the probablility of the actual result (i.e., of detecting no such particles) would be 37%. An upper limit for the absolute intensity of such particles at sea level is computed on the basis that on the average, one particle would be detected during the course of the experiment. In this way, an upper limit of 1.0×10^{-3} particles/cm^2/sterad/hr is found. That is to say, the absolute intensity of negative particles in the momentum interval 0.37 to 1.65 bev/c that are absorbed in 147 g/cm^2 of Pb equivalent is $(0.0^{+1.0}_{-0.0}) \times 10^{-3}$ particles/cm^2/sterad/hr. (auth)

5382

Applied Physics Lab., Univ. of Wash.
THE MOMENTUM SPECTRUM OF COSMIC RAYS AT 3.4 KILOMETERS. J. E. Henderson, C. E. Miller, D. S. Potter, J. Todd, and A. W. Wotring. [nd] 94p. (NP-4688)

The momentum spectrum of the non-electronic ionizing component of cosmic radiation for momenta between 100 Mev/c and 2.5 Bev/c for both the positive and negative particles, filtered through 5 cm of Pb, has been obtained. It is found to be quite similar to the sea-level spectrum in this momentum interval. The ratio of particles of momentum higher than 2.5 Bev/c to those below 2.5 Bev/c is the same within statistics as that at sea level. The momentum spectrum for momenta between 100 Mev/c and 2.5 Bev/c for the ionizing component of the cosmic radiation has been found with the electronic component not removed. In comparison with the spectrum in which the electronic component has been removed, it is found that the electron contribution extends to about one Bev/c. Fairly large numbers of protons have been found. There are enough protons at the lower momenta to account for the increase in the positive excess from sea level to 3.4 km. At slightly higher momenta it has been computed that there are enough protons to completely account for the positive excess. No evidence was found for a particle of mass 1000 electron masses, indicating that, if present at 3.4 km, they are rare as compared with protons. (auth)

5383

Applied Physics Lab., Univ. of Wash.
ANALYSIS OF THE HARD COMPONENT OF THE COSMIC RADIATION INTO ITS PROTONIC AND MESONIC COMPONENTS AT 3.4 KILOMETERS AND AT SEA LEVEL. J. E. Henderson, C. E. Miller, D. S. Potter, and J. Todd, Jr. [1953] 103p. (NP-4689)

The momentum spectrum of protons between 0.75 and 2 bev/c at 3.4 km has been derived from the momentum spectrum of particles stopping in given range intervals. The flux of protons is about half as large as the negative meson flux. The momentum spectrum of protons in the same momentum interval at sea level has been found. The proton flux is about 5% of the total meson flux. A momentum spectrum for mesons alone has been derived by subtracting the proton flux from the positive meson spectrum. The spectra of positive and negative mesons are equal up to 1.25 bev/c momentum. Above this point the positive excess is greater than 1. The proton flux has been correlated to the "N" component of Rossi and the intensity of protons in the momentum interval measured found to be proportional to the "N" component. The mean free path in air of this "N" component has been found to be 132 g/cm^2. This value was obtained in the comparison of intensities between 3.4 km and sea level; and also between 3.4 km and 30,000 ft. Definite indications that the peak in the momentum spectrum obtained at 4.3 km is due to large numbers of protons in the cosmic radiation have been presented. The mean free path for removal of protons in Pb has been shown to be 174 ± 30 g/cm^2. (auth)

5384

Applied Physics Lab., Univ. of Wash.

THE ZENITH ANGLE DEPENDENCE OF COSMIC RAY PROTONS. F. M. Charbonnier, W. R. Davis, G. R. Garrison, J. E. Henderson, C. E. Miller, and W. M. Sandstrom. [1952] 69p. (NP-4690)

The proton spectrum for particles in the momentum band 0.4 to 1.0 Bev/c and the meson spectrum for particles in the momentum band 0.09 to 0.34 Bev/c at zenith angles 45° east, vertical, and 45° west have been obtained at 3.3 km elevation and magnetic latitude 48° north. The behavior of the zenith angle dependence of μ mesons has been found to be consistent with a transformation involving only the momentum loss by ionization of mesons at minimum ionization, and the well-defined radioactive properties of this particle. The zenith-angle dependence of protons, along with a simplified phenomenological calculation of same, is presented as new data on the nucleonic cascade. It is found experimentally that the gross zenith-angle dependence will fit a $\cos^{3.2}\theta$ distribution at 45° east or west. The simplified calculation assumes that a unidirectional component of the primary radiation will suffer exponential absorption along its original path with a path length for removal of 120 g/cm^2 of air and acquire an ultimate distribution at 3.3 km due to scattering fitting a $\cos^n\omega$ law, n being an adjustable parameter. It is found that a value of n of about 6.5 yields a unidirectional distribution which, when integrated over all angles, results in a gross zenith angle dependence agreeing with $\cos^{3.2}\theta$. The $\cos^n\omega$ distribution with n equal to 6.5 is quite sharp and leads to the conclusion that the average projected scattering angle per collision is only about 5°. (auth)

5385

Applied Physics Lab., Univ. of Wash.

THE MESON COMPONENT OF COSMIC RADIATION. F. M. Charbonnier, W. R. Davis, G. R. Garrison, J. E. Henderson, C. E. Miller, and W. M. Sandstrom. [1952] 109p. (NP-4693)

The momentum spectrum of the non-electronic component has been determined in the momentum range 0.34 to 2 bev/c. It has been shown that the experimental results gave what is essentially a meson momentum spectrum in this momentum interval. By comparison of the spectrum obtained in the vertical direction and those spectra obtained at an angle to the vertical, an estimate of the average height of production of the mesons observed has been determined. Also an upper limit has been placed on the amount of meson production occurring at low altitudes. The zenith-angle dependence of the intensity as a function of momentum has been investigated. Similarly, the positive-to-negative ratio has been studied as a function of both the direction of incidence and the momentum. The east-west asymmetry of the positive and negative meson components taken separately has been measured, and the result has been used to give an estimate of a lower limit to the average height of the mesons observed in this investigation. The result of this last computation is found to be in agreement with the results of the previous computation of an average height of production. (auth)

5386

Applied Physics Lab., Univ. of Wash.

COSMIC RAY PROTONS AT 3.4 KILOMETERS AND THE NUCLEAR ABSORPTION OF PROTONS IN LEAD. Gerald R. Garrison, C. E. Miller, J. E. Henderson, F. M. Charbonnier, D. S. Potter, and W. M. Sandstrom. [1952] 71p. (NP-4694)

The proton momentum spectrum at elevation 3.4 km and magnetic latitude 48° N has been given. It is considered to be valid for the momentum interval 0.7 tp 2.0 bev/c and agrees at the lower end of the interval with that obtained by Whittemore and Shutt (Phys. Rev. 86, 940(1952)). Protons form 20 ± 2% of all ionizing particles (except electrons) in this momentum interval. It should be noted that this is an average value for the interval from 0.7 to 2.0 bev/c. At 2.0 bev/c the proton component is only 10% of the total radiation. The mean free path for removal of protons by nuclear interaction in Pb has been computed as 206 ± 30 g/cm^2 for protons of momentum between 0.9 and 2.5 bev/c, and the result compared with those of other investigators. The determination of the meson positive excess has been included in an effort to report all available information provided by the data. (auth)

5387

Rochester Univ.

THE ABSORPTION MEAN FREE PATH OF THE HIGH ENERGY NUCLEONIC COMPONENT OF COSMIC RADIATION. M. F. Kaplon, J. Z. Klose, D. M. Ritson, and W. D. Walker. July 6, 1953. 6p. (NP-4696)

The absorption mean free path, λ, of cosmic radiation with energy > 10^{12} ev is determined. Data were taken from two emulsion stacks, consisting of 24 alternate 3-mm Pb plates and 250-μ G-5 emulsions. One exposure was made at 10,700 ft with the emulsion planes set at 45° with the vertical. The second exposure was made at 90,000 ft with the emulsion planes in a horizontal position. Gross transformations were applied to the resulting equations, yielding a value of $\lambda = 129 \pm 15$ gr/cm^2. (K.S.)

5388

EFFECTS AT GODHAVN AND LOWER LATITUDES OF CHANGES IN ENERGY AND COMPOSITION OF SOLAR COSMIC RAYS. V. Sarabhai and R. P. Kane. Phys. Rev. 91, 688-9(1953) Aug. 1.

Time series have been derived for changes of the amplitude and the hour of maximum of the diurnal component of the daily variation of the pressure-corrected meson intensity at Godhavn from Carnegie Institution data. While these series show some features which are strikingly similar to those observed at other stations, the variability at Godhavn is much greater than elsewhere. Comparison of the series at Godhavn with the corresponding series for the mean changes observed at Cheltenham and Christchurch permits information to be derived concerning changes in the mean energy of cosmic-ray primaries responsible for the daily variation, and their "stiffness" in the geomagnetic field. On the basis of an interpretation in terms of continuous emission of cosmic rays from the sun, there is evidence for an increase in the mean energy of solar cosmic rays from 1940 to 1944. Reasons are given for believing that during 1944, the solar cosmic rays became richer in alpha particles as compared to protons. (auth)

5389

ANISOTROPIC DISTRIBUTION OF SECONDARIES IN EXTREME ENERGY COSMIC-RAY STARS. Frank C. Roesler and C. B. A. McCusker. Phys. Rev. 91, 690-4(1953) Aug. 1.

The connection between the conservation law for angular momentum and the anisotropy observed in cosmic-ray stars produced by energetic primaries is investigated. A model is proposed which is probably reasonable for noncentral nucleus-nucleus collisions and may have some meaning for nucleon-nucleon collisions; it is based on assuming that the disk-shaped "interaction volume" consists of many zones acting independently. If equilibrium is reached within individual zones, the particles emerging from one zone ought to be distributed isotropically in its center-of-mass frame. In a noncentral collision these frames will in general, in accordance with the conservation of momentum, be different for different zones. Some anisotropy in the total angular distribution follows, but on this model it could never reach the degree frequently observed. (auth)

5390

COLLISION LENGTHS OF NEUTRAL, PENETRATING-SHOWER-PRODUCING COSMIC RADIATION IN LIGHT AND HEAVY WATER. Darol Froman, James Kenney, and Victor H. Regener. Phys. Rev. 91, 707-12(1953) Aug. 1.

The collision length, L_c, of neutral penetrating-shower-producing cosmic radiation incident through a reinforced concrete roof of thickness 25 g/cm^2 at Los Alamos, N.M., altitude 2280 m was measured in light and heavy water. The values obtained were, for H_2O, $L_c = 113 \pm 10$ g/cm^2 and for D_2O, $L_c = 123 \pm 10$ g/cm^2. Equal masses of O_2 per unit area in the H_2O and D_2O absorbers were used for a determination of the difference between the collision cross sections of the deuteron and of the proton for the incident particles. The value obtained for this difference was $\sigma_D - \sigma_P = 13 \pm 15$ mb. (auth)

ELECTRICAL DISCHARGE

5391

DISTRIBUTION OF PARTICLES IN A NON-UNIFORMLY HEATED FULLY IONIZED GAS. A. A. Abrikosov. Translated from Zhur. Ekksptl'. i Teoret. Fiz. 22, 310-20(1952). 10p. (AEC-tr-1584; AERE Trans. 11/3/5/302)

An abstract of this report appears in Nuclear Science Abstracts as NSA 7-1162.

5392

DEPENDENCE OF JOSHI EFFECT ON ELECTRONIC PART OF THE DISCHARGE CURRENT. N. A. Ramaiah, M. G. Bhatawdekar, and N. Subrahmanyam. J. Chem. Phys. 21, 1160-4(1953) July.

Association of Joshi effect Δi with electronic part i_e of the discharge current i was investigated by elimination principle. The electronic part was suppressed under transverse magnetic field H. In agreement with Joshi's theory, negative effect (−percent Δi) in water and iodine vapor was maximum in i and negligible in $i - i_e$; comparatively, positive effect was unaffected by H. (auth)

ELECTRONS

5393

EMISSION OF FAST ELECTRONS IN A MAGNETIC FIELD. A. A. Sokolov, N. P. Klepikov, and I. M. Ternov. Doklady Akad. Nauk S.S.S.R. 89, 665-8(1953) April 1. (In Russian)

The quantum correction for the total intensity of electron emission in a constant magnetic field has been calculated. The corrections became noticeable only in the energy range $E \sim mc^2(mcR/h)^{1/2}$, where R is the orbit radius. (J.S.R.)

5394

STRAGGLING DISTRIBUTIONS FOR ELECTRONS IN PASSING THROUGH THIN FOILS. F. Kalil and R. D. Birkhoff. Phys. Rev. 91, 505-9(1953) Aug. 1.

Straggling distributions for the 624-kev conversion electrons from Cs^{137} are examined with a high-resolution β spectrometer for foils of Be, Al, Cu, Sn, Ta, and Pb. Agreement is found with the Blunck-Leisegang theory for the heavy elements, but the energy-loss distributions for light elements are found to be about 1.8 times as wide as expected. (auth)

INSTRUMENTS

5395

Argonne National Lab.

INSTRUMENT RESEARCH AND DEVELOPMENT DIVISION QUARTERLY PROGRESS REPORT FOR MARCH, APRIL, AND MAY 1953. June 1953. 19p. (ANL-5068)

A photoelectric comparator head which is to be used with a Zeiss measuring microscope is described. The volume resistivity of lucite was measured as 3×10^{18} ohm-cm. Results of in-pile measurements on insulators are briefly reported. Differential pulse-height distributions were determined for anthracene and stilbene crystals and for four plastic scintillators, using a Cs^{137} source and a RCA-5819 photomultiplier. The spectral distribution of fluorescence from various polystyrene and polyvinyltoluene solid-solution scintillators was determined. Transit-time spreads and maximum-peak anode currents were measured for several DuMont experimental photomultipliers. A solution of HB-40 and polystyrene was tested as contact fluid in scintillation counters. Two Harshaw canned crystals were tested for pulse height and resolution at 100% humidity. Further progress is reported on measuring the drift velocity of photoelectrons. (For preceding period see ANL-4998.) (L.M.T.)

5396

Radiation Lab., Univ. of Calif., Berkeley

INSTRUCTION MANUAL FOR DC PORTABLE VAPOR DETECTOR MODEL 3EPS. C. S. Presenz. June 1, 1953. 22p. (UCRL-2033(rev.))

Several circuit and calibration changes have been incorporated into the Model 3EPS vapor detector, previously described in UCRL-2033 (cf. NSA 7-1967). An r-f oscillator has been added to provide automatic ignition and further stability to the ultraviolet lamp. (K.S.)

5397

ON THE INFRARED SENSITIVITY OF COPPER-OXIDE PHOTOCELLS PREPARED UNDER REDUCED PRESSURE IN THE FIELD OF A HIGH-FREQUENCY INDUCTION HEATER. A. I. Andrievsky and A. L. Rvachyov. Translated from Doklady Akad. Nauk S.S.S.R. 89, 245-7(1953). 3p. (NSF-tr-35; D-89-245)

The preparation and characteristics of copper oxide photocells are discussed. Samples were prepared in the heating coil of a h-f generator under various air pressures. It is shown that a variation in the temperature, pressure, and time factors will produce cells of different photosensitivities in the green, red, and infrared regions. (K.S.)

MEASURING INSTRUMENTS AND TECHNIQUES

5398

Atomic Energy Research Establishment, Harwell, Berks (England)

4 Pi GEIGER COUNTERS AND COUNTING TECHNIQUES. D. B. Smith. June 18, 1953. 16p. (AERE-I/R-1210)

The design and construction of 4-π G-M counters and the technique of absolute β measurements are discussed. Investigation of foil adsorption indicates that correction by use of a "sandwich" foil is in error. Losses from self-absorption in the source appear larger than was previously expected. An appendix contains an analysis of foil corrections. (auth)

5399

Argonne National Lab.

THE PREPARATION OF GAS FOR ASSAY OF TRITIUM IN ORGANIC COMPOUNDS. K. E. Wilzbach, Louis Kaplan, and W. G. Brown. June 1953. 10p. (ANL-5056)

A simple method has been developed for the conversion of T in organic compounds to a mixture of H and methane, suitable for assay in an ionization chamber or internal gas counter. The compound is heated for three hr at 640°C with a mixture of Zn, nickelic oxide, and water in a sealed tube made of Pyrex 1720 glass. A wide variety of organic compounds has been analyzed with accuracy and reproducibility of 1%. Analysis over a wide range of T activities is facilitated since T is retained (to the extent of about 1.5%) only in the glass tube, which is discarded after a single use. Manipulations required for an analysis can be performed with simple apparatus in less than 30 min. (auth)

5400

Ames Lab.

A MULTICHANNEL PULSE HEIGHT ANALYSIS SYSTEM UTILIZING A 35 MM. FILM RECORD. Warren A. Hunt, Wayne Rhinehart, John Weber, and D. J. Zaffarano. June 22, 1953. 23p. (ISC-359)

A system is described for obtaining quantitative amplitude-distribution data for events which can be displayed as proportional voltage pulses for visual observation on a cathode-ray oscilloscope. The use of a circuit which intensifies the top of each flattened pulse during display permits photographing the events as dots on a moving 35-mm film at rates of 20,000 per sec or greater. An automatic electro-mechanical "reader" is described which will scan the resulting film and produce a printed record of the number of events in each of 100 discrete "channels" with an accuracy comparable to the best available from other "kick-sorting" schemes. A spectrum of over 500,000 events can be recorded on 100 feet of film. (auth)

5401

Knolls Atomic Power Lab.

GENERALIZED OFF-AXIS EFFECTS FROM DISK SOURCES OF RADIATION. J. H. Smith and M. L. Storm. June 1, 1953. 43p. (KAPL-918)

In the field of shielding it is frequently necessary to calculate biological radiation doses at any point in space due to disk sources of radiation. A typical example of such a source is the leakage radiation from an end of a cylindrical reactor. If G(R) is the dose at distance R from a unit point source (for example, $G \sim (e^{-\sigma R}/R^2)$), then the dose due to a disk source of radius "a" with source strength $S(\rho)$ is given by

$$D(z,\epsilon,a) = \int_0^a \int_0^{2\pi} G[(z^2+\epsilon^2+\rho^2-2\epsilon\rho\cos\theta)^{1/2}]\, S(\rho)\, \rho\, d\rho d\theta \quad z > 0$$

where (z, ρ, θ) are the usual cylindrical co-ordinates, $z = 0$ is the source plane, and $(z, \epsilon, 0)$ locate the dose point. This integral is quite general and arises in many physical problems. In counter measurements, use of $G \sim 1/R^3$, $S = 1$ yields the solid angle subtended by the counter from any point in space. In neutron physics the slowing-down density of neutrons from a circular source of finite radius can be calculated in the age-theory approximation. For most G's the integral can not be evaluated in closed form. Three alternative series for $D(z, \epsilon, a)$ are presented, each having a direct physical interpretation and a different region of convergence. The results are obtained for a class of analytic functions G(R), the possible singularities of which occur only at $R = 0$ for finite R; and for $S(\rho)$ of the form $\Sigma_p S_p \rho^{2p}$. The approach in each case is to expand either the double integral or one of the two single integrals in a power series in $\cos\theta$, ϵ, or ρ prior to performing the detailed integrations. (auth)

5402

De Paul Univ.

SCINTILLATION TECHNIQUES APPLIED TO ELECTRON ENERGY STUDIES. QUARTERLY PROGRESS REPORT [FOR] APRIL 1, 1953 TO JUNE 30, 1953. Edwin J. Schillinger, Jr. 19p. (NP-4701; Quarterly Progress Report 5)

Changes have been made which greatly increase the h-v stability of the electron-accelerating unit. Electron-beam tests on the unit are described, and a tentative re-design to incorporate magnetic-deflection techniques is proposed. A baffle was introduced in the vacuum system to reduce back-streaming of the diffusion-pump oil. Some preliminary results are reported on the preparation and use of chrysene crystals in scintillation counting. (For preceding period see NP-4568.) (L.M.T.)

5403

Armour Research Foundation

FUNDAMENTAL STUDIES ON SCINTILLATION PHOSPHORS: FINAL REPORT. G. M. Burgwald and L. Reiffel. July 9, 1953. 65p. (NP-4703)

A study of the nature of afterglow in inorganic scintillation phosphors when bombarded by high-energy γ radiation is described. The afterglow characteristics of several of the more important scintillation phosphors were studied, both under standard conditions and under variable temperature and pressure. All of the important inorganic phosphors studied exhibit varying degrees of afterglow, and in cases where the level of activity being measured varies by orders of magnitude, the effect of residual light from the crystal becomes important. (For preceding period see NP-4611.) (auth)

5404

Chalk River Project (Canada)

ELECTRONICS BRANCH PROGRESS REPORT FOR APRIL TO JUNE 1953. George Cowper. 24p. (PR-P-18-E)

Scintillation spectroscopy studies indicate that, provided a good photomultiplier is available, some advantage is to be gained from the use of a MgO diffusing screen around the crystal rather than shiny, Al foil. Additional testing of RM12 mallory cells and various thermionic tubes is reported. Further progress is reported on the design of the cold-cathode dekatron scaler. Results obtained with various transistors in switching, trigger, and amplifier circuits are summarized. Six type-1059 Veeder-Root registers in life tests have recorded 25×10^6 counts with 30,000 reset operations. An automatic graphic recorder for sample decay measurements was tested. (For preceding period see PR-P-17-E.) (L.M.T.)

5405

THE EFFECT OF THE STIMULATING ACTION OF THE EXCITING LIGHT ON PHOSPHORESCENCE. L. I. Anikina. Translated from Doklady Akad. Nauk S.S.S.R. 88, 41-4(1953). 4p. (NSF-tr-23; D-88-41)

An experiment is described to show that, under steady-state excitation by light of wavelength $\lambda = 302$ mμ, the luminescence of SrS·CaS(Ce,Sm) phosphor increases about 1.5 times when the sample is simultaneously irradiated with an infrared radiation source of great intensity. This value for the relative change of the yield is close to the value for the change of yield, about 1.3, for the same wavelength obtained from the absolute measurements. Equations to determine the energy of luminescence by the ratio of the radiant energy to the absorbed energy, expression of radiant energy and absorbed energy quantities under steady-state conditions, energy of luminescence by the ratio of the intensities of the absorbed to the radiated light at some instant time, non-steady excitation, and the absolute emission of energy are given. (J.A.G.)

5406

THE CORRECTION FOR FINITE ANGULAR RESOLUTION IN DIRECTIONAL CORRELATION MEASUREMENTS. J. S. Lawson, Jr. and H. Frauenfelder. Phys. Rev. 91, 649-52 (1953) Aug. 1.

The correction of a measured directional-correlation function for the finite angular resolution of the radiation detectors (scintillation counters) has been investigated experimentally in the case of the Ni^{60} γ-γ cascade. The results show that the correction factors depend upon the pulse-height selection. The significance of this result for precision measurements is discussed. (auth)

5407

THE STORAGE OF ENERGY IN SILVER ACTIVATED POTASSIUM CHLORIDE. C. E. Mandeville and H. O. Albrecht. Phys. Rev. 91, 566-7(1953) Aug. 1.

Crystals of KCl-Ag and NaCl-Ag have been excited by x-ray irradiation. The photostimulated light yield of the ultraviolet emission band has been observed simultaneously with application of the stimulating near-ultraviolet light. The decay with time of the stored energy in the two phosphors is compared. (auth)

MESONS

5408

Rochester Univ.
SOME K-PARTICLE MASS MEASUREMENTS. D. M. Ritson. [1953] 3p. (NP-4695)

Mass measurements were made on three K particles using a new technique of measuring gap density (the fractional length of track unoccupied by grains) as a function of residual range in electron-sensitive photographic emulsion. In determining the mass values it was assumed that singly charged particles of the same velocity, but differing mass, will produce tracks of identical gap density. Then if the ranges at which the velocities are equal are known, the ratio of the masses equals the ratio of the ranges. For precision measurement of the gap density a motor drive was attached to the stage of a Bausch-Lomb scattering microscope so that a track was driven past a hairline at the rate of 100 μ in 4 min. The observer was equipped with two counters driven by a common pulser, one of which ran continuously, and the other which counted only when a button was pressed. The button was pressed whenever the hairline was over a portion of track unoccupied by grain, and the ratio of the two counter readings gave the gap density. For the K-particle mass measurements one or more reference protons were selected which ran at similar depth in the emulsion to the K-particle track. The mass values determined were 970 ± 100, 1020 ± 100, and 870 ± 100 m_e. (L.M.T.)

5409

THE PRODUCTION OF POSITIVE PIONS BY 341-MEV PROTONS ON PROTONS. W. F. Cartwright, C. Richman, M. N. Whitehead, and H. A. Wilcox. Phys. Rev. 91, 677-88(1953) Aug. 1.

The production of positive pions by protons on protons has been studied at 0, 35, and 58° to the beam of 341-Mev protons produced by the Berkeley synchrocyclotron. In the collision of two protons, two reactions are possible which lead to a π^+ meson: (1) $P + P \rightarrow \pi^+ + D$ and (2) $P + P \rightarrow \pi^+ + N + P$. The experimental results at 0° show an energy spectrum from 0 to 70 Mev which is fairly flat except for a large peak at the high-energy end. The flat portion of the spectrum can only be due to reaction (2). A comparison of the shape of the peak with the results of the phenomenological theory of Brueckner and Watson shows that the peak is due solely to reaction (1). This fact, together with a measurement of the beam and of the energy of the pions from reaction (1), gives the value 275.1 ± 2.5 electron masses for the mass of the positive pion. The angular distribution in the center-of-mass system for reaction (1) as obtained from the data at the above three angles, is $(3.3 \pm 1.2)[0.11 \pm 0.06 + \cos^2\theta] \times 10^{-29}$ cm^2 sterad^{-1}, and the total cross section for reaction (1) is $(1.8 \pm 0.6) \times 10^{-28}$ cm^2. These results have been compared with the results obtained by Durbin, Loar, and Steinberger and by Clark, Roberts, and Wilson on the inverse reaction, $\pi^+ + D \rightarrow P + P$. Using the theorem of detailed balancing, these experiments lead to the value zero for the spin of the positive pion with good certainty. (auth)

5410

THE PRODUCTION OF CHARGED PHOTOMESONS FROM HELIUM. HYDROGEN-HELIUM RATIOS. II. M. J. Jakobson, A. G. Schulz, and R. S. White. Phys. Rev. 91, 695-8(1953) Aug. 1.

A study similar to that made by the same authors on H and D has been made of charged photomesons produced from He. Measurements were made at the three angles of 45, 90, and 135°. π^+ mesons were detected by scintillation counters and delayed coincidence detection. π^+ and π^- mesons were detected with Ilford C2-200μ nuclear emulsions. The π^-/π^+ ratios are 0.99 ± 0.15, 1.07 ± 0.17, and 0.91 ± 0.13 for angles of 45, 90, and 135°, respectively. The total cross section for π^+ production is $4.8 \pm 1.0 \times 10^{-29}$ cm^2 proton^{-1} Q^{-1} for He as compared to $10.3 \pm 2.1 \times 10^{-29}$ for H. This indicates that a proton in He is about one-half as effective as a free proton for the photoproduction of π^+ mesons. A comparison is made of the π^+ meson production from H, D, He, and C. (auth)

MICROWAVES

5411

Research Lab. of Electronics, Mass. Inst. of Tech.
MICROWAVE SPECTRUM OF THE WATER MOLECULE. Desmond Walter Posener. May 14, 1953. 164p. (NP-4686; Technical Report 255)

Centrifugal distortion theory applicable to the water molecule and its isotopic modifications has been rederived, apparently eliminating misprints and errors now present in the literature. From infrared data and this theory, rotational constants and distortion parameters have been calculated for the molecules H_2O, D_2O, and HDO, and the resulting theoretical transition frequencies compared with those observed in the microwave region. Theoretically calculated parameters have also been used to obtain Q-branch frequencies in HDO; while the frequencies computed directly are considerably different from those observed, a simple method is available for relating the two sets with very good accuracy. Analysis of the method leads to the inference that the theoretical distortion corrections are very nearly the true ones, and that reasonable agreement with experiment can be obtained by a simple variation of the effective moments alone. The resulting parameters also account satisfactorily for the known $|\Delta J| = 1$ transitions in HDO, whose frequencies are still better explained by a further small change in the theoretical effective moments together with a rather large variation of another distortion constant. The detailed discussion of the procedure used indicates the consistency of the results is good. For this type of molecule, centrifugal distortion effects are so large that approximate methods of calculation have only a limited usefulness; the validity of the Hillger-Strandberg-Kivelson-Wilson approximation for the calculation of Q-branch frequencies in HDO is discussed in detail. The effective reciprocal moments of inertia for HDO and new transitions observed in the microwave spectra of D_2O and HDO are given. (auth)

MOLECULAR PROPERTIES

5412

ON THE USE OF A SINGLE SCALE FACTOR IN ATOMIC WAVE FUNCTIONS. I. Charles W. Scherr. J. Chem. Phys. 21, 1237-40(1953) July.

Single scale factors are determined for converting 1s, 2s, and 2p self-consistent field orbitals of atoms in the first row of the periodic table into one another. Several simple relationships are found which allow predictions for F and Ne. (auth)

5413

ON THE USE OF A SINGLE SCALE FACTOR IN ATOMIC WAVE FUNCTIONS. II. APPLICATION TO OVERLAP INTEGRALS. Charles W. Scherr. J. Chem. Phys. 21, 1241-2(1953) July.

A method of estimation of two-center homopolar overlap integrals between self-consistent field atomic orbitals, due to Mulliken, has been tested and verified. (auth)

NUCLEAR PHYSICS

5414

EFFECT OF NUCLEON ORBITS ON SLOW NEUTRON CAPTURE CROSS SECTIONS AND ON THE SPIN OF ODD-ODD NUCLEI. I. A. Vaisman. Translated from Doklady Akad. Nauk S.S.S.R. 88, 431-4(1953). 4p. (NSF-tr-6; D-88-431)

A brief abstract of this article appears in Nuclear Science Abstracts as NSA 7-3867.

NUCLEAR PROPERTIES

5415

CHLORINE PURE QUADRUPOLE RESONANCES. D. W. McCall and H. S. Gutowsky. J. Chem. Phys. 21, 1300 (1953) July.

Chlorine nuclear quadrupole resonances have been detected in several solids. Values are tabulated for measurements made at liquid N temperatures. (K.S.)

5416

THE REGULARITIES IN THE CHANGE OF THE NUCLEON BINDING ENERGIES IN NUCLEI. V. A. Kravtsov. Doklady Akad. Nauk S.S.S.R. 90, 749-51(1953) June 11. (In Russian)

The increase of the binding energy of a neutron by addition of a proton to the nucleus and of a proton by addition of a neutron to the nucleus was calculated and graphed for nuclei containing up to 140 neutrons and 96 protons. The decrease of the binding energy for neutrons by addition of a neutron and for protons by addition of a proton was also calculated and graphed. In all cases there is close agreement between the theoretical and experimental results. (J.S.R.)

5417

PHOTONEUTRON CROSS SECTIONS. R. Montalbetti, L. Katz, and J. Goldemberg. Phys. Rev. 91, 659-73(1953) Aug. 1.

The neutron yields resulting from photoneutron reactions have been measured as a function of betatron energy from threshold to 23 Mev for 22 elements. These yield curves have have been analyzed by the photon difference method to give the total cross section $\sigma = (\sigma_{\gamma,n} + \sigma_{\gamma,np} + 2\sigma_{\gamma,2n})$ as a function of photon energy. Whenever possible, this cross section has been resolved into its components using threshold considerations and subsidiary data. Some general conclusions based on the new results are presented regarding the systematics of (γ,n) reactions. (auth)

5418

NUCLEAR MAGNETIC RESONANCE IN SOLID HYDROGEN. F. Reif and E. M. Purcell. Phys. Rev. 91, 631-41(1953) Aug. 1.

The fine structure of the nuclear magnetic resonance line in solid H at low temperatures (1.15°K) was studied experimentally using a recording-meter technique. The observed line shape can be explained quantitatively by the magnetic-dipole interaction of the two protons in a H molecule, provided one takes into consideration the effect of the crystalline potential responsible for lifting the rotational degeneracy of the ortho-molecules in the solid. Extremely general assumptions concerning the nature of this crystalline potential are sufficient to account for the nuclear resonance data; in particular, one can treat the case where this potential, by virtue of the random mixture of ortho- and para-molecules in the solid, is not symmetric and not the same at the positions of different ortho-molecules. An apparent hysteresis effect in solid H was observed, and some experiments were also performed on solid HD and D_2. The general theory developed in connection with the foregoing experiments also predicts the detectability in solid H of a resonance line in zero external magnetic field, this line constituting a direct measure of the dipole interaction responsible for the fine structure of the resonance line in high fields. Despite experimental difficulties peculiar to the zero-field experiment, this resonance line was found at the expected frequency of about 165 kc/sec. (auth)

5419

NEW NUCLIDES PRODUCED IN CHLORINE SPALLATION. Manfred Lindner. Phys. Rev. 91, 642-4(1953) Aug. 1.

The radiation properties of the β-emitting nuclides Si^{32} and Mg^{28} are described. Si^{32} was found to have a maximum probable half life of 710 yr, emitting β particles of $E_{max} \sim$ 100 kev. Absence of γ radiation with this nuclide is indicated. (auth)

5420

CONVERGENCE OF THE ADIABATIC NUCLEAR POTENTIAL. Abraham Klein. Phys. Rev. 91, 740-8(1953) Aug. 1.

The leading term of the potential of order 4n, n an arbitrary integer, of the pseudoscalar theory with pseudoscalar coupling is computed by a method which takes advantage of the special pair character of this term. It is shown that the coefficients increase with n as $n!(n-1)!$; thus, despite the decreasing ranges, the unrenormalized potentials grow enormously with n, even in the nonrelativistic domain. The breakdown of the expansion in μ/M for a given order is also indicated. A weakness of the discussion is that it does not include radiative corrections. (auth)

5421

ENERGY LEVELS IN Be^8 FROM THE REACTION $Li^6(He^3,p)Be^8$. W. E. Kunz, C. D. Moak, and W. M. Good. Phys. Rev. 91, 676(1953) Aug. 1.

The energy spectrum of protons from the breakup of B^9 following He^3 capture by Li^6 has been obtained by means of a NaI crystal spectrometer. The energy range of the spectrum which corresponds to a range of excitation in Be^8 up to 11 Mev shows two groups of protons. Because of systematic errors known to be present, the energy determinations are preliminary. With an uncertainty of about 0.25 Mev, the energy difference between proton peaks corresponds to an energy interval in Be^8 of 2.87 Mev. (auth)

5422

FISSION CROSS SECTION OF URANIUM-234. R. W. Lamphere. Phys. Rev. 91, 655-8(1953) Aug. 1.

The neutron-induced fission cross section of U^{234} has been measured from threshold to 4-Mev neutron energy, using the T(p,n) reaction with a tritium gas target, and the Oak Ridge 5-Mev Van de Graaff. The curve rises from threshold at 350 kev to 1.3 barns at 4 Mev. There is a minimum at 1.08 Mev and another at 2.30 Mev. These dips are about 13% and 7%, respectively, of the cross section at these points. Statistics in these regions are sufficient to establish the fact that the minima are real to a probability of 10^9 relative to a "best fit" curve with no extrema. (auth)

5423

THE HYPERFINE STRUCTURE AND NUCLEAR MOMENTS OF Pr^{141}. Hin Lew. Phys. Rev. 91, 619-30(1953) Aug. 1.

The hyperfine structure of the ground state of Pr^{141} has been studied by the atomic-beam magnetic-resonance method. It has been established that the electronic ground state of Pr is $4f^3 6s^2$, $^4I_{9/2}$. Of the five hyperfine intervals arising from this electronic state and a nuclear spin of $^5/_2$, the lowest two have been observed. They are $W(F = 4)-W(F = 3) =$ 3708.05 Mc and $W(F = 3)-W(F = 2) =$ 2782.25 Mc. If the hfs is assumed to be entirely due to an interaction between the $^4I_{9/2}$ state and the nucleus, the observed intervals may be expressed in terms of a magnetic dipole interaction constant A and a nuclear electric quadrupole interaction constant B. It is found that $A = 926.03 \pm 0.1$ Mc and $B = -13.9 \pm 1.0$ Mc. From these constants, the nuclear moments have been evaluated by means of approximate methods. The values obtained are $\mu = +3.8$ nm, $Q = -0.054 \times 10^{-24}$ cm^2. (auth)

NUCLEAR REACTORS

5424

Atomic Energy Research Establishment, Harwell, Berks (England)

FISSION BALANCE TESTS IN GLEEP. F. C. W. Colmer, E. R. Wiblin, and W. B. Woollen. Mar. 1953. 36p. (AERE-N/R-1163)

A description is given of a method of testing samples of U and graphite for use in piles. The samples are introduced, by means of special apparatus, into a hole in GLEEP, and their properties are compared by a measurement of the consequent change in reactivity of the pile. The system is calibrated by reference to the known capture cross-section of B, which obeys a 1/v law of absorption. The properties of individual samples are referred to standards for both U and graphite. An assessment of the over-all accuracy and brief mention of the actual figures obtained are included. (auth)

5425

General Electric Co., ANP Project

FISSION PRODUCT DECAY GAMMA ENERGY SPECTRUM. John Moteff. [nd] 79p. (APEX-134)

A study has been made to determine the γ-energy spectrum of the thermal-fission products of U^{235} at various times after shutdown of a reactor. The results yield the energy spectrum for 1000 hr of reactor operation and 1, 5, 10, 60, 120, and 240 days after shutdown. The spectrum was divided into seven convenient energy groups and each γ was assigned the mean energy of the group in which it occurs. The energy group distributions of the γ decay rates also are included for various times of operation and shutdown. The operating times considered were 10 min, 1 hr, 10, 100, 1000 hr, and infinite operation. The after-shutdown times were from 4 hr to 10 days, except for the 8 months after-shutdown time for 1000-hr operation. The total decay rates check very well with the Way-Wigner expression. All the results of this study were made applicable to any thermal reactor using U^{235} by expressing the activities as percentages of saturation activity and by normalizing the results to one watt of reactor power. (auth)

NUCLEAR TRANSFORMATION

5426

Atomic Energy Research Establishment, Harwell, Berks (England)

THE FISSION YIELDS OF Ru^{103} AND Ru^{106}. W. H. Hardwick. Approved May 15, 1953. 16p. (AERE-C/R-1180)

The fission yields of Ru^{103} and Ru^{106} for U^{235} using pile neutrons have been determined using Ba^{140} as a standard. The value for Ru^{106} was also obtained relative to Cs^{137}. The disintegration rate of the separated Ru^{103} was determined by γ counting and that of Ru^{106} was determined by β counting. The values obtained for the percentage fission yields are 2.85 ± 5.7% for Ru^{103} and 0.38 ± 7.6% for Ru^{106}. (auth)

5427

Ames Lab.

ANGULAR DISTRIBUTION OF PHOTOPROTONS FROM ALUMINUM AND TANTALUM. Marvin M. Hoffman and D. J. Zaffarano. Aug. 1952. 62p. (ISC-291)

Al and Ta have been exposed to the bremsstrahlung radiation of the Iowa State College synchrotron, and the tracks of emitted particles have been recorded in photographic emulsions. Ilford C-2 500μ plates were exposed in an evacuated camera provided with a thin window in each end through which the beam passed. Each observed track was checked against four selection criteria, and for those which were satisfactory, the position, depth, and length were recorded. The emulsions were exposed at 25°, 60°, 90°, 120°, and 155° to the direction of the collimated x-ray beam and to maximum x-ray energies of 25, 40, and 65 Mev for Al and 25, 38, and 65 Mev for Ta. In the case of Ta, the angular distribution obtained has been plotted and compared to the function $I = A + B \sin^2 \theta$. Using the best fit of this function to the experimental points, B/A = 1.7 for protons from 0 to 19 Mev, B/A = 8 for protons from 18.6 to 28 Mev, and B/A = ∞ for protons from 27 to 40 Mev. For Al the function $I = (\sin \theta \ p \sin \theta \cos \theta)^2$ plus a constant portion was fitted to the experimental points. The constant portion comprised the entire group for the 25-Mev exposure, while for the 40-Mev exposure p = 0.7 ± 0.1, and for the 65-Mev exposure p = 0.6 ± 0.2. For higher energy protons observed behind absorbers, the relative number of observed protons has been plotted against the corrected proton energy. The observed number of protons was found to decrease with increasing proton energy as $E^{-6.5}$ for protons of 19 to 28 Mev, as $E^{-7.5}$ for protons of 27 to 40 Mev from Ta, and as E^{-6} for protons of 16 to 28.5 Mev, as E^{-7} for protons of 27 to 43 Mev from Al. The value of the ratio of the number of protons per mole of target material (Al or Ta) to the number of neutrons per mole of Cu^{63} for each of the various exposures is given. (K.S.)

5428

Johns Hopkins Univ.

TRITON INDUCED ACTIVITIES IN Mg AND Al. Eric Iwersen, W. S. Koski, and Franco Rasetti. June 11, 1953. 12p. (NYO-3903)

Triton bombardment of Al^{27} and Mg^{26} gave a 6.5-min Al activity as a result of the $Al^{27}(t,p)\,Al^{29}$ reaction and a 21.8-hr activity of Mg produced by the $Mg^{26}\,(t,p)Mg^{28}$ reaction. Studies of the γ-ray spectrum of Mg^{28} showed that a 391 ± 5-kev γ ray and possibly two more γ rays with energies 0.95 and 1.35 Mev were associated with the decay of this isotope. A search was made for a $P^{31}(t,p)P^{33}$ reaction but negative results were obtained. (auth)

5429

PREPARATION OF A $ZINC^{65}$ SOURCE OF VERY HIGH SPECIFIC ACTIVITY. Tosiko Yuasa. Compt. rend. 236, 2498-9(1953) June 29. (In French)

Zn^{65} produced by the Cu(d,2n) reaction is recovered by electrolysis. The Zn has a specific activity of 4 mc/mg. (J.S.R.)

5430

THE GAMMA RADIATION FROM B^{11} BOMBARDED BY PROTONS. Torben Huus and Robert B. Day. Phys. Rev. 91, 599-605(1953) Aug. 1.

The spectrum of γ radiation emitted when B^{11} is bombarded by protons has been investigated with a NaI scintillation counter. Capture γ rays have been found which occur in a direct transition to the ground state of C^{12} and a cascade transition through a level in C^{12} at 4.45 Mev. Yield curves for these γ rays have been obtained for proton energies up to 2.8 Mev, and the cross sections for emission of the various γ rays are given. In addition to the well-known resonance at 0.163 Mev, new resonances have been found at 0.675 Mev with $\Gamma = 0.33$ Mev and 1.388 Mev with $\Gamma = 1.27$ Mev. Spin and parity assignments for these states which are deduced from the results of this and the $B^{11}(p,\alpha)Be^8$ reactions are 2^- (or 3^+) and 1^-, respectively. A 2.13-Mev γ ray has also been observed, which is produced in an inelastic-scattering reaction involving the first excited state of B^{11}. This reaction exhibits a resonance at 2.664 Mev with a width of 48 kev. The cross section at resonance is 3.1×10^{-26} cm^2. (auth)

5431

EXCITATION CURVES FOR α PARTICLES FROM B^{11} BOMBARDED WITH PROTONS. Olof Beckman, Torben Huus, and Črtomir Zupančič. Phys. Rev. 91, 606-9(1953) Aug. 1.

The spectra of the α particles emitted from B^{11} under proton bombardment have been investigated by means of a 180° double-focusing magnetic spectrometer. In the range of bombarding energies from 0.3 to 1.8 Mev, the α group leading to the first excited state of Be^8 exhibits the same resonances, at 0.67 and 1.4 Mev, as does the proton capture process, whereas the α group leading to the ground state of Be^8 is resonant only for the higher energy. The approximate values for the cross sections at the maxima, are in the former case, 600 mb and 150 mb, respectively, and, in the latter, 6 mb. Spin and parity assignments of 2^- and 1^- for the two levels, respectively, are compatible with these results. (auth)

5432

NEUTRONS FROM THE PROTON BOMBARDMENT OF Be^9. Fay Ajzenberg and W. W. Buechner. Phys. Rev. 91, 674-5 (1953) Aug. 1.

Be^9 has been bombarded with 6.59-Mev protons. The resultant neutrons, studied by means of nuclear emulsions, indicate an excited state of B^9 at 2.37 ± 0.04 Mev. A continuum of neutrons has also been observed. (auth)

5433

PHOTONEUTRON PRODUCTION EXCITATION FUNCTIONS TO 320 MEV. Lawrence W. Jones and Kent M. Terwilliger. Phys. Rev. 91, 699-707(1953) Aug. 1.

Photoneutron yields from 11 elements were obtained from bremsstrahlung of maximum energy 13.5 to 320 Mev with the reaction $Cu^{63}(\gamma,n)Cu^{62}$ as a monitor. The yield data were analyzed by a photon difference method to give the excitation functions for photoneutron production. Most of these excitation functions showed the typical resonance shape in the 20-Mev region, a low but finite "tail" to about 80 Mev, and a large rise from there to 320 Mev. With the use of a calculated neutron multiplicity $\int_0^{80} \sigma dE$ for Ta was found to be 5.1 Mev-barns, somewhat higher than $\int_0^{\infty} \sigma dE$ predicted by Levinger and Bethe for the electric-dipole interaction. The rise above 80 Mev is probably due to mesonic interactions. At the meson threshold, with data for the neutron multiplicity from π^- absorption, the photon absorption cross section was found to obey the relation $\sigma = 0.32A^{1.3} \times 10^{-28}$ cm^2. (auth)

PARTICLE ACCELERATORS

5434

Research Foundation, Ohio State Univ.

DESCRIPTION OF THE MODIFICATIONS OF THE OHIO STATE UNIVERSITY CYCLOTRON. FINAL REPORT, PART 1. H. J. Hausman. May 28, 1953. 9p. (AECU-2607)

A description is presented of modifications in the cyclotron which were carried out to increase the beam current and voltage output. The construction of the vacuum tank, vacuum-pumping system, resonant dee lines, cyclotron dees, and ion source is discussed. An isometric plan drawing of the assembled cyclotron modifications is included. (L.M.T.)

RADIATION ABSORPTION AND SCATTERING

5435

Brookhaven National Lab.

SHIELDING OF A HIGH CURRENT CYCLOTRON AND A VAN de GRAAFF MACHINE. M. Clark. Nov. 5, 1952. 23p. (BNL-227)

The minimizing of neutron background count for radiation detection devices used in conjunction with the Brookhaven high current cyclotron and Van de Graaff generator is discussed. Calculations are restricted to order of magnitude estimations, owing to the complex geometries involved. The cyclotron is designed to produce high neutron densities from high energy protons or deuterons impinging on a suitable target. Results are obtained by certain assumptions concerning the target location and the tolerable neutron doses within a separate experiment building. Some approximations are given for activities to be allowed for in the river-water coolant. In the case of the Van de Graaff machine, where unwanted neutrons arise from particle interactions with surrounding materials, expressions are derived for the effectiveness of a simple solid wall shield and a complete enclosure of the generator proper. Calculations on neutron scattering from the walls of a bare room are included. (K.S.)

5436

Oak Ridge National Lab.

REACTOR LEAKAGE FOR SHIELDING CALCULATIONS. E. P. Blizard. July 24, 1953. 8p. (CF-53-7-170)

Mathematical methods for transforming spherical reactor-shield interface flux geometry to plane surface geometry are derived. A single assumption is made, applicable only to surface-source distributions, which depends upon the existence of a unique attenuation kernel for all pairs of points in space. The equivalence of imaginary surface sources to volume-distributed sources is established. Consideration is given to the doses inside and outside a sphere with volume-distributed sources, and an expression is given in terms of plane functions. Suggestions are made concerning the proper choice of the relaxation length for various reactor core-shield characteristics. (K.S.)

5437

General Electric Co., ANP Project

LINEAR AND QUADRATIC BUILDUP APPROXIMATIONS TO GAMMA ENERGY ABSORPTION. S. H. Minnich. Mar. 9, 1953. 21p. (DC-53-3-144)

A discussion of simple models for the representation of scattered γ radiation is presented, as well as a discussion of the relation between γ-energy absorption and γ-energy current. Relations are derived for simple cases. Buildup factors derived from the simple models are compared with more exact calculations. For small numbers of relaxation lengths, agreement is close enough to indicate that the simple model is useful for some types of calculations. The following relations are those derived for the representation of energy absorption as a function of radius from a point isotropic source:

Linear approximation:

$$E_a(r) = \frac{Q\mu_A\,[1 + k_{11}(\mu r)]e^{-\mu r}}{4\pi r^2}; \; k_{11} = \frac{\mu}{\mu_A} - 1$$

Quadratic approximation:

$$E_a(r) = \frac{Q\mu_A\,[1 + k_{21}(\mu r) + \tfrac{1}{2}k_{22}(\mu r)^2]e^{-\mu r}}{4\pi r^2}$$

$$k_{21} = \frac{\mu-\mu_A}{\mu} \quad \cdot\; k_{22} = \frac{(\mu-\mu_A)^2}{\mu\mu_A}$$

where $E_a(r)$ is the energy-absorption rate in terms of the source-energy unit, per unit volume per unit time, Q is the source energy per unit time, μ is the total γ cross section of the medium, and μ_A is the energy-absorption cross section of the medium. (auth)

5438

General Electric Co., ANP Project

ATTENUATION OF FISSION PRODUCT GAMMA RAYS THROUGH WATER. John Moteff and Alice Barnett. July 17, 1953. 17p. (DC-53-7-88)

Calculations have been made on the attenuation characteristics of water for the fission-product gammas. Various times of operation and shutdown were considered as the history of the fission products. The results are presented in the form of curves, one group giving the energy-transmission fraction as a function of water thickness, and the other group showing the variation of the dose rate per operating watt as a function of distance from the source. (auth)

5439
Radiation Lab., Univ. of Calif., Berkeley
ANGULAR DISTRIBUTIONS AND TOTAL CROSS SECTIONS FOR THE INELASTIC SCATTERING OF 31-MEV PROTONS FROM HEAVY ELEMENTS (thesis). Robert Martin Eisberg. June 15, 1953. 50p. (UCRL-2240)

Angular distributions and total cross sections for the inelastic scattering of 31-Mev protons from four heavy elements, Pb, Au, Ta, and Sn, have been measured. Differential cross sections were obtained at five angles: 30, 45, 60, 90, and 135°. The differential cross sections are strongly peaked forward, increasing by about a factor of ten as the scattering angle goes from 135 to 30°. The total cross sections all have values ranging from 0.25 barns, for Sn, to 0.29 barns, for Pb. (auth)

5440
SCATTERING OF X RAYS BY METALS IN THE RANGE OF VERY SMALL ANGLES. B. M. Rovinskiĭ and V. M. Genkin. Doklady Akad. Nauk S.S.S.R. 89, 673-5(1953) April 1. (In Russian)

The scattering of x rays at small angles by electrolytic Cu and cast Al was investigated. The dispersion at angles less than 1 or 2° is dependent on the density of submicroscopic particles of the dispersion element. (J.S.R.)

5441
OBSERVATIONS OF THE SCATTERED RADIATION INSIDE AND OUTSIDE A 1,000-CURIE COBALT^{60} TELETHERAPY ROOM. J. G. Brown. Radiology 61, 82-7(1953) July.

The amount of scattered radiation inside and outside a 1,000-c Co^{60} teletherapy room has been determined under various treatment conditions. The effects of dose rate, field size, and size of phantom have been determined. The length of time the shutter of the machine is open and its effect on the amount of radiation outside the room are discussed. The variation of half value layer of the scattered radiation with the angle of scattering is determined. A discussion of how economics may be realized is included. (auth)

5442
THE X-RAY ABSORPTION COEFFICIENTS FOR A BOROSILICATE GLASS. S. L. Whitcher and Norman Todd. Radiology 61, 103-5(1953) July.

The x-ray-absorption coefficients for one common borosilicate glass were computed from those of the individual elements. Data on composition of the glass are presented, and calculations are summarized in tabular form. (C.H.)

RADIATION EFFECTS

5443
THE WAVE LENGTH DEPENDENCE OF THE CONDUCTIVITY OF CADMIUM SULFIDE CRYSTALS IRRADIATED WITH X RAYS AND γ RAYS. G. Frohnmeyer, R. Glocker, and D. Messner. Naturwissenschaften 40, 338(1953) June. (In German)

CdS crystals, varying in thickness from 0.05 to 0.5 mm, were irradiated in the range from 1-A x rays to 1-Mev γ rays in an ionization chamber. The change in the conductivity of the crystals with respect to the wave length of the irradiating light was in good agreement with theory. (J.S.R.)

RADIOACTIVITY

5444
THE ANALYSIS OF ANGULAR CORRELATION AND ANGULAR DISTRIBUTION DATA. M. E. Rose. Phys. Rev. 91, 601-15(1953) Aug. 1.

Consideration of a number of problems which arise in the analysis of angular-correlation and angular-distribution data is given. These include corrections for finite angular resolution. For a source of constant strength the questions of determination of most probable counting rates, their associated errors, and the determination of the most probable coefficients in the Legendre representation of the data, as well as the errors in the determination of these coefficients, are examined. A brief discussion of the corrections for a decaying source is also presented. (auth)

5445
GAMMA-GAMMA ANGULAR CORRELATION IN Ni^{60}. E. D. Klema and F. K. McGowan. Phys. Rev. 91, 616-18(1953) Aug. 1.

The angular correlation of the γ rays emitted in cascade from the excited states of Ni^{60} has been measured at increments of 10° from 90 to 270° with automatic apparatus using NaI detectors and 5819 photomultipliers. For a dilute CoCl$_2$ source, the correlation obtained is $W(\theta) = 1 + (0.131 \pm 0.017)\cos^2\theta + (0.024 \pm 0.017)\cos^4\theta$. The anisotropy, $(\alpha_2 + \alpha_4)/\alpha_0 \equiv R$, where $W(\theta) = \alpha_0 + \alpha_2\cos^2\theta + \alpha_4\cos^4\theta$, is 0.1557 ± 0.0010. The expected value of R, taking the finite angular resolution of the apparatus into account, is 0.1517. A change in the anisotropy to a value of 0.1453 ± 0.0023 due to a chemical change in the source was observed. (auth)

RARE EARTHS AND RARE-EARTH COMPOUNDS

5446
SLOW NEUTRON SCATTERING CROSS SECTIONS FOR RARE EARTH NUCLIDES. W. C. Koehler and E. O. Wollan. Phys. Rev. 91, 597-9(1953) Aug. 1.

Coherent neutron-scattering amplitudes and total-scattering cross sections have been determined for a number of elements and separated isotopes of the rare earth series. One nuclide, Sm^{152}, was found to scatter with negative phase. (auth)

SPECTROSCOPY

5447
ON THE THEORY OF ISOTOPIC DISPLACEMENT. D. Ivanenko and N. Kolesnikov. Translated from Doklady Akad. Nauk S.S.S.R. 89, 253-6(1953). 4p. (NSF-tr-39; D-89-253)

An abstract of this article appears in Nuclear Science Abstracts as NSA 7-3967.

THEORETICAL PHYSICS

5448
Rochester Univ.
ON THE INVARIANT FORMS OF THE NUCLEON-NUCLEON INTERACTION. David Feldman. July 27, 1953. 10p. (NYO-3826)

The invariant scattering matrix is used as a basis for derivation of the possible forms of nucleon-nucleon interaction. The method has the particular advantage in that it allows for a systematic treatment of both exchange and non-exchange forces. (auth)

5449
Rochester Univ.
THE CONSTRUCTION OF POTENTIALS IN QUANTUM FIELD THEORY. Abraham Klein. July 13, 1953. 5p. (NYO-3829)

It is shown that the construction of scattering kernels in a quantum field is possible, by a specified method, from the usual Schroedinger equation. The treatment is simplified by considering the case of coupling, linear in the meson variables, without nucleon-pair production. The consequences of applying the method to non-linear interactions and pair production are noted. (K.S.)

5450
THE METHOD OF REGULARIZATION AND THE THEORY OF PARTICLES WITH ARBITRARY SPIN. V. I. Karpman. Translated from Doklady Akad. Nauk. S.S.S.R. 89, 257-60 (1953). 4p. (NSF-tr-43; D-89-257)

An abstract of this report appears in Nuclear Science Abstracts as NSA 7-3974. (K.S.)

5451
THE SEPARATION OF THE ROTATIONAL COORDINATES FROM THE N-PARTICLE SCHROEDINGER EQUATION. II. C. F. Curtiss. J. Chem. Phys. 21, 1199-1208(1953) July. (cf. NSA 5-1698).

Group theoretical methods are used to separate the rotational coordinates from the N-particle Schroedinger equation and obtain a set of equations which are particularly applicable to the study of collisions involving two sets of particles or two molecules. The coordinates used to describe the configuration of the N particles in a center of gravity coordinate system are those describing the orientation of the system as a whole, the relative orientation and separation of the two molecules, and the internal configuration of each of the molecules. Coupled differential equations involving only the coordinates describing the internal configuration and separation of the molecules are obtained. As a special case the equations are applied to a system consisting of two diatomic molecules. (auth)

5452
THE QUANTUM THEORY OF DISTURBED FIELDS. B. T. Geĭlikman. Doklady Akad. Nauk S.S.S.R. 90, 359-62(1953). (In Russian)

The interaction of meson fields with heavy particles under the condition $g^2/\hbar c \gg 1$ is investigated. Simplifying assumptions permit the solution of equations for scalar and pseudoscalar fields. (J.S.R.)

5453
THE PROBLEM OF MANY BODIES IN QUANTUM MECHANICS. A. F. Tsandep. Doklady Akad. Nauk S.S.S.R. 90, 761-4(1953) June 11. (In Russian)

The wave function for a nuclear configuration in which the number of neutrons is greater than the number of protons is analyzed. (J.S.R.)

5454
A GENERALIZED SELF-CONSISTENT FIELD METHOD. J. C. Slater. Phys. Rev. 91, 528-33(1953) Aug. 1.

A self-consistent field method is set up, general enough to be used in case of configuration interaction between any number of states each represented by a single determinantal wave function. Thus it is more general than the Hartree-Fock method, which is limited to a single determinantal wave function. A variation method cannot be used for, if a sufficiently extensive configuration interaction is carried out, an equally good final value of the energy and wave function will be obtained irrespective of the one-electron functions used. Instead, the original postulate of Hartree is used, that each electron is assumed to move in the averaged charge distribution of all other electrons and all nuclei. It is shown that when this condition is properly interpreted, it leads to a unique potential for the self-consistent field, all the one-electron orbitals being solutions of the same Schroedinger equation, and hence orthogonal to each other. This field is somewhat different from that of Hartree, who did not literally follow this prescription for finding the potential. For the case where we are using a single determinantal function, the present method reduces to the simplification of the Hartree-Fock method recently proposed by the writer. (auth)

5455
THE SIMILARITY THEORY OF RELATIVITY AND THE DIRAC-SCHRÖDINGER THEORY OF ELECTRONS. II. Banesh Hoffmann. Phys. Rev. 91, 751-2(1953) Aug. 1.

The variational principle given in a previous paper under this title (Phys. Rev. 89, 52(1953)) is here modified slightly in three stages. First the integral is made similarity-invariant. Then a sign is changed so that a consistent signature for the various terms shall be possible. Finally, a numerical discrepancy that was found on making a detailed comparison with the Jordan theory of the variable gravitational constant is removed, so that the equations of the latter theory for empty space are obtained as a special case of the present theory when all quantities except g_{ab} and ω are set equal to zero. (auth)